South Australia.

DEPARTMENT OF MINES.

MINING REVIEW

FOR THE

HALF-YEAR ENDED JUNE 30th, 1919.

No. 30.

Compiled by LIONEL C. E. GEE, S.M., Chief Registrar and Recorder, Department of Mines;

ISSUED UNDER THE AUTHORITY OF THE

HONORABLE W. H. HARVEY, M.L.C.,

Minister of Mines.

Adelaide:
R. E. ROGERS, GOVERNMENT PRINTER, NORTH TERRACE.

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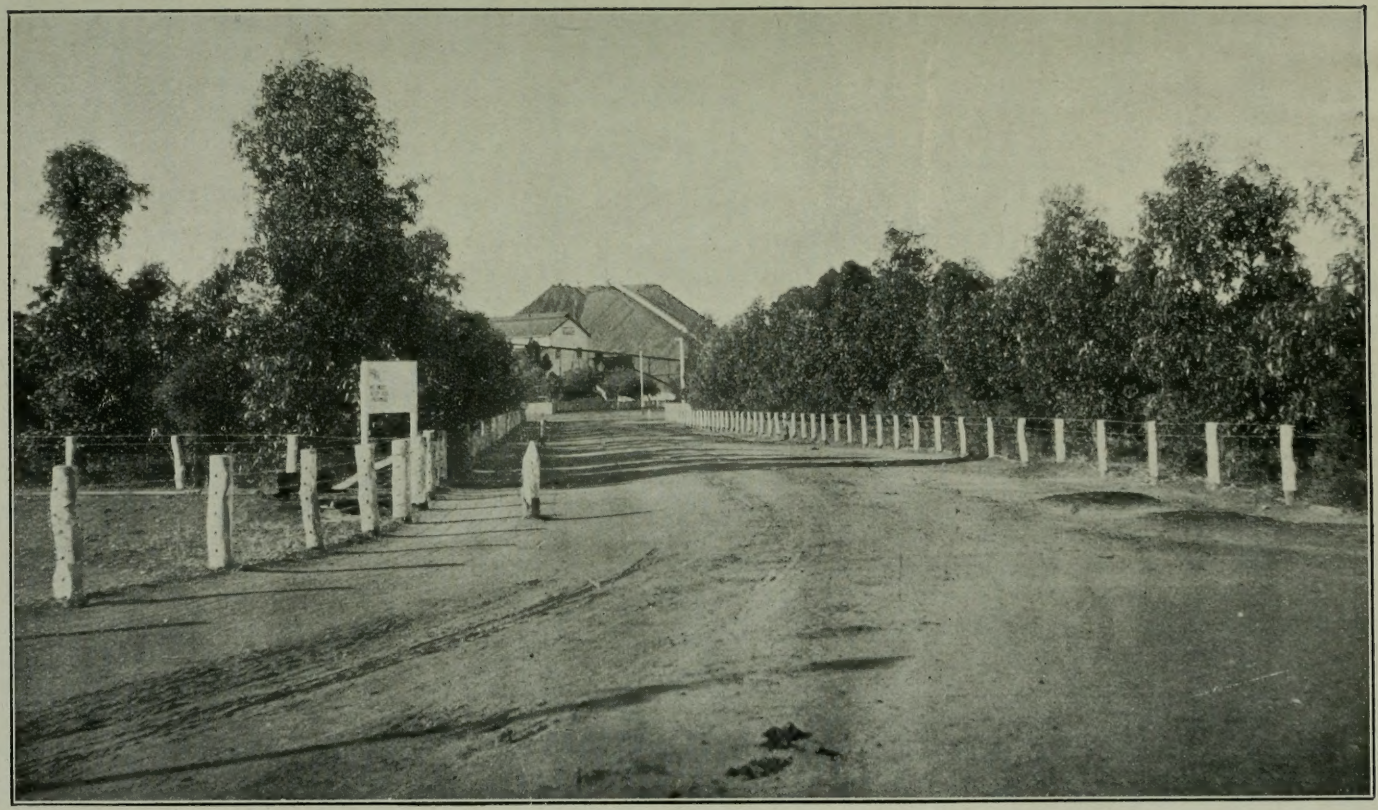


Main Entrance, Wallaroo Mines.

Frontispiece.]

Miners' Rights and Privileges thereunder.

A miner's right is obtainable at the Department of Mines, Adelaide, also at the issuing stations in the various mining districts, at a cost of 5s.; it is in force for one year from the date of issue, and may be renewed at any time during its currency for another term of one year on payment of 5s. The holder is authorised to prospect on any mineral lands for any metal, mineral, coal, or oil, and to peg out (of the prescribed shape and dimensions) gold, precious stones, mineral, coal, and oil claims, and also obtain leases, as detailed below.

AREAS AND WORKING CONDITIONS.

GOLD LEASES—Maximum area, 20 acres; working conditions, one man to every five acres.

MINERAL LEASES—40 acres; one man to every 10 acres.

MISCELLANEOUS LEASES—

Salt	640 acres;	special conditions.
Gypsum	640 "	"
Mining Works	10 "	one man.
COAL OR OIL LEASES	640 "	one man to every 40 acres.
GOLD DREDGING LEASES	200 "	special conditions.
MINERAL CLAIMS	40 "	
GOLD CLAIMS	30ft. x 30ft., alluvial; 100ft. x 600ft., reef.	
PRECIOUS STONES CLAIMS	150ft. x 150ft.	

Gold and Precious Stones claims must be constantly worked—one man for each claim—and mineral claimholders must employ two men for each claim. Amalgamation of either gold (reef), or mineral claims reduces the labor conditions by one-half until payable results have been obtained.

Gold, mineral, coal, and oil leases are granted for a term not exceeding 21 years—the two former at a rental of 1s. per acre per annum and a royalty of 6d. in the pound on net profits, the latter at a rental of 6d. per acre per annum until coal or oil is found in payable quantities, when 1s. per acre is payable and a royalty of 6d. in the pound on the net profits.

The Minister may permit, for the concentration of labor, of the amalgamation of not more than four adjoining gold or mineral leases.

Any number of gold (reef), mineral, coal, or oil leases may be held by one person.

Licences to search for twelve months for precious stones, mineral phosphates, oil, rare metals, minerals, and earths are issued on specific mineral lands, not exceeding five square miles in area for one person, a fee of 20s. being charged for each square mile or portion thereof. The licences for mineral phosphates, oil and rare metals, minerals and earths give a preferential right to a lease over a portion of the area, as prescribed, and in case of a licence to search for precious stones, to a precious stones claim not exceeding the prescribed area.

MINING ON PRIVATE PROPERTY.

The Mining on Private Property Act of 1909 and the amending Act of 1916 apply only to land, the metals, minerals, precious stones, metalliferous ores, coal, shale, oil, salt, or gypsum on or under which are alienated from the Crown in fee simple.

Prior to 1886 all metals, minerals, &c., were sold with the land (these lands are defined as " Private land " in the Acts), but since 1886 gold, and since 1888 all the metals and minerals in lands sold by the Government are reserved to the Crown and can be dealt with under the Mining Act of 1893.

All arrangements for entry and for mining on private land can be made, if feasible, between the prospector and the owner of the freehold without reference to the Mining on Private Property Acts, *save that a copy of any agreement made must be forwarded without delay to the Mines Office, and six monthly returns giving full details of the mining operations must be furnished.*

The procedure necessary under the Acts is now according to the following sum, mary :—

(1) The prospector will obtain a miner's right.

(2) He will apply for a written authority to enter and peg out from the Minister, or a warden, or mining registrar ; to obtain which it is necessary for him to lodge at the Mines Office a statutory declaration made before a Justice to the effect that there are reasonable grounds, which must be shortly stated, for supposing the land to be mineral bearing ; also a plan showing the land referred to, and a deposit of a sum of money as security against any possible damage done by him during the fourteen (14) days allowed for preliminary prospecting. In connection with the deposit required, the amount should, if possible, be arranged between the applicant and the owner of the land ; but if at the expiration of seven (7) days after an application in this behalf has been made by the applicant to the owner, the amount cannot be agreed upon, the amount of the deposit will be assessed by the department.

(3) On receiving the authority, before actually entering upon the private land, three (3) clear days' notice in writing must be given to the owner and occupier.

(4) The authority entitles the prospector to prospect between the hours of 6 a.m. and 6 p.m. for a period not exceeding fourteen (14) days on an area not exceeding one square mile ; also to make trenches and sink holes, provided that the area of the surface broken by such operations does not exceed 100 square feet. The prospector may also remove samples not exceeding 28lbs. in weight.

(5) If he is satisfied he may peg out the area which he desires to have included in a claim or lease.

(6) The prospector then endeavors to make a private arrangement with the owner of the property for the working of the mineral deposit.

(7) If, after the expiry of one month, he fails to arrive at a satisfactory agreement with the owner, he can apply for a compulsory mining lease.

(8) On the granting of such lease the work of mining or actually raising ore for sale can be commenced.

The right formerly possessed by the owner of the land to work the property himself within a period of two months by complying with the necessary working conditions no longer exists.

NOTES FOR OPAL MINERS.

Every miner must have a miner's right. The fee is 5s. per annum, and they are obtainable at the Adelaide Mines Office, Tarcoola, Port Augusta, Beltana, Hergott (Marree), and Oodnadatta Police Stations, and from Mr. J. W. Duck, Leigh Creek (Copley).

A miner's right may be issued to any " person "—that is, any individual above the age of 16 years. This right forms the basis of all operations under the Mining Acts. Without it a person has no protection, cannot legally prospect or mine, or peg out a claim, and, moreover, is liable to a penalty of £1 per day for unlawfully prospecting and mining.

The holder is authorised to prospect for any metal, mineral, precious stones, coal, or oil, the property of the Crown, with the right of possession when found. It is the authority for pegging out a claim and also to occupy for residence a quarter of an acre of land, from which the holder has the right to remove any buildings erected by him, and he may cut and use timber from Crown lands for his own mining and domestic purposes. Each claim must be represented by a miner's right, and it must be noted that no person can hold more than *one* precious stones claim at the same time.

The area allowed for a precious stones claim is 150ft. by 150ft., and is to be pegged out in the following way :—Four pegs are to be securely placed in the ground to mark the four corners. Each peg must be not less than 3in. thick and project not less than 3ft. above the surface of the ground, and have clearly marked on it the number of the miner's right and the date of pegging. From each peg two trenches must be cut in the ground not less than 3ft. long, 1ft. wide, and 6in. deep, pointing in the directions of the boundary lines of which the peg forms the corner. In rocky ground stone direction piles may be made instead of the trenches. All these marks must be maintained in position while the claim is held, or the claim will be liable to forfeiture. When pegging out ground adjoining another claim a wall 3ft. wide must be left between the claims. The working conditions are one man to be kept constantly employed for each precious stones claim. Constantly employed means eight hours for five working days of the week and four hours for Saturday. Claims can be held for 30 days without registration, and under exceptional circumstances this period may be extended for a further 14 days. The registration must be made at the Adelaide Office, and the form of application is simple and readily obtainable. It must show name and address of applicant, number of miner's right, nature of claim, locality, and sketch showing position. The miner's right must be attached to the application and a fee of 2s. 6d. paid. The certificate of registration is then issued from the Adelaide Office, and the miner's right returned to the applicant with the registered number marked thereon. Care must be taken that the miner's right, by virtue of which the claim is held, is kept valid by renewal at the proper time and not allowed to lapse, otherwise the certificate will become void and the title to the ground lapses.

Every holder of a claim is protected—

(*a*) While he is incapacitated from work by illness;
(*b*) Absent on urgent business;
(*c*) In attendance at a court of law;
(*d*) During the continuance of floods or droughts;
(*e*) While he is engaged upon work in public or national interest;
(*f*) During public holidays; and
(*g*) During 14 days commencing on the 22nd December, and in mines that are over one day's railway journey from Adelaide the Christmas exemption may extend for one month from December 15th, under the Minister's authority.

The onus of proof of good cause for absence lies on the claimholder. Notices should be placed on the claim and also forwarded to the Mines Office, Adelaide.

PREFACE.

THE period under review has been noteworthy for the dislocation of the branch of the mining industry concerned with the production of copper. The serious fall in the price of copper led to the cessation of smelting operations at Wallaroo, and consequently to the almost complete stoppage of the production of copper ore throughout the State. The subsequent recovery of the market price of copper gives promise of a brighter future, and the mines would probably have already reached the stage of full normal production, if the dislocation of marine transport had not so seriously curtailed supplies of fuel.

The development of the resources of non-metallic minerals continues satisfactorily, and attention is called to reports printed in this *Review* on deposits of barytes, whiting, graphite, and asbestos.

The Chief Registrar and Recorder has continued the work, begun in the last *Mining Review*, of describing the provisions made by mining companies in South Australia for the welfare of their employees In this issue the work carried out at Moonta, Wallaroo, and Kadina by the Moonta and Wallaroo Mining and Smelting Co. Ltd., is described, after a personal investigation by Mr. Gee. The photographs used in illustration of this description have been courteously supplied by the General Manager of the Company.

L. KEITH WARD,
Director of Mines.

August 30th, 1919.

INDEX.

DECENNIAL RETURN SHOWING, SO FAR AS CAN BE ASCERTAINED, PRODUCED IN

	1909.		1910.		1911.		1912.		1913.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	ozs.	£	ozs.	£	ozs.	£	ozs.	£	ozs.	£
Gold	7,111	30,206	6,603	28,000	3,537	15,000	6,592	28,000	6,556	27,800
Silver	1,660	167	6,250	625	1,400	140	2,700	326	2,650	300
	Tons		Tons						Tons	
Silver Lead Ore	70	416	25	22	—	—	—	—	153	1,100
	cwts.		cwts.		cwts.		cwts.		cwts.	
Copper	113,940	334,584	102,040	306,120	118,440	332,500	125,900	461,500	143,222	488,986
	Tons									
Copper Ore and Regulus	1,230	4,003	—	—	—	—	—	—	—	—
	cwts.									
Lead	140	90	400	260	—	—	—	—	—	—
	Tons		Tons		Tons		Tons		Tons	
Ironstone	16,120	8,296	46,200	21,945	42,300	26,400	42,200	26,375	60,658	37,911
Manganese Ore	—	—	—	—	—	—	—	—	—	—
Molybdenite	—	—	—	—	—	—	—	—	—	—
					cwts.		cwts.		cwts.	
Wolfram Ore	—	—	—	—	40	154	5	20	2½	10
Radium and Radio Active Material (Uranium Ore)	—	—	—	—	—	—	—	—	—	3,620
Asbestos	—	—	—	—	—	—	—	—	—	—
Alunite	—	—	—	—	—	—	—	—	—	—
									Tons	
Barytes	—	—	60	180	—	—	—	—	103	320
					Tons		Tons			
Bluestone	—	—	299	5,980	181	4,163	102	2,550	13	325
Chalk (Talc)	—	—	40	100	100	200	120	600	50	250
Fireclay and Pipeclay	—	—	922	188	1,463	169	200	150	320	240
Gypsum	—	—	15,800	9,000	9,700	7,275	12,000	9,000	7,150	5,362
Kaolin	—	—	—	—	—	—	—	—	—	—
Limestone	13,765	2,464	18,600	3,720	28,700	7,175	50,600	12,500	44,300	11,075
Magnesite	—	—	—	—	—	—	—	—	—	—
Mica	—	—	—	—	—	—	—	—	—	—
Ochre (crude)	—	—	180	746	105	105	300	300	250	250
Opal	—	—	—	—	—	—	—	—	—	—
Pebbles, Flint	—	—	—	—	458	856	120	420	514	1,799
Phosphate Rock	3,772	3,697	5,200	5,200	5,800	5,800	6,100	6,100	5,950	6,545
Pyrites	—	—	2,920	3,270	2,496	2,560	—	—	—	—
Salt (crude)	51,407	25,594	54,000	27,000	65,000	40,600	64,300	40,187	65,000	48,750
Sulphuric Acid	—	—	4,758	3,370	4,626	6,940	5,095	7,642	5,602	7,983
Soapstone	—	—	90	116	—	—	—	—	—	—
Unenumerated	—	3,873	—	—	—	—	—	—	—	—
£	—	413,390	—	415,842	—	450,037	—	595,670	—	642,626

OUTPUT AND VALUE OF THE VARIOUS METALS AND MINERALS SOUTH AUSTRALIA.

1914.		1915.		1916.		1917.		1918.		1909-1918.	
Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Total Output.	Total Value.
ozs.	£	ozs.	£	ozs.	£	ozs.	£	ozs.	£	ozs.	£
6,258	26,581	6,081	25,830	7,769	33,000	7,145	30,334	6,189	26,252	63,841	271,003
3,006	314	2,462	277	3,427	514	1,825	333	1,608	331	26,988	3,327
Tons		Tons		Tons		Tons		Tons		Tons	
18	215	59	625	243	4,659	622	12,018	503	10,161	1,693	29,216
cwts.		cwts.		cwts.		cwts.		cwts.		cwts.	
137,614	417,487	154,506	561,247	145,580	822,527	144,262	902,495	143,378	828,556	1,328,882	5,456,002
—	—	—	—	—	—	—	—	—	—	Tons 1,230	4,003
—	—	—	—	—	—	—	—	—	—	27	350
Tons		Tons		Tons		Tons		Tons			
42,622	37,137	237,375	264,612	188,329	200,382	328,386	359.723	257,029	277,279	1,261,219	1,260,060
—	—	250	563	544	2,700	264	1,597	1,080	17,876	2,138	22,736
—	—	—	—	—	—	cwts. 18½	359	cwts. 4½	98	T. c. 1 3	457
cwts.		cwts.		cwts.						cwts.	
6	24	5	35	4	28	4	30	—	—	66½	301
—	5,215	—	—	—	—	—	—	—	686	—	9,521
—	—	7	5	Tons. 21	210	—	—	—	—	T. c. 21 7	215
Tons						Tons				Tons	
20	40	—	—	134	670	29	145	—	—	183	855
		Tons						Tons			
560	1,680	290	1,320	456	2,052	790	2,370	1,352	4,059	3,611	11,981
—	—	3	59	—	—	—	—	—	—	598	13,087
—	—	—	—	103	309	—	—	235	453	648	1,912
1,223	917	7,165	5,374	1,605	1,204	1,874	1,405	1,501	710	16,273	10,357
16,276	12,207	19,900	17,413	20,371	17,825	12,776	11,179	32,013	28,012	145,986	117,273
10,239	16,382	1,209	1,934	1,635	2,616	1,967	3,442	2,513	4,888	17,563	29,262
54,054	16,892	71,723	22,413	74,641	23,325	68,464	21,395	72,209	34,813	497,056	155,772
—	—	80	160	166	332	150	300	440	666	836	1,458
—	—	—	—	—	—	37½	337	—	—	37½	337
84	84	28	28	40	80	78	156	30	60	1,095	1,809
—	—	—	—	—	750	—	500	—	7,175	—	8,425
270	829	385	1,023	158	474	1,217	3,956	2,816	11,849	5,938	21,206
6,083	6,691	4,614	5,536	5,013	5,839	5,101	6,064	8,074	10,773	55,707	62,245
—	—	—	—	—	—	—	—	—	—	5 416	5,830
65,000	48,750	64,000	80,000	66,400	83,000	46,858	93,716	88,519	177,038	630,484	664,635
5,940	8,910	5,965	13,421	6,919	10,378	6,190	8,820	6,746	9,613	51,841	77,077
—	—	—	—	—	—	—	—	75	150	165	266
—	—	—	—	—	—	—	—	—	—	—	3,873
—	600,355	—	1,001,885	—	1,212,874	—	1,460,674	—	1,451,498	—	8,244,851

Mining Operations during the Half-year ended June 30th, 1919.

AREA AT PRESENT HELD UNDER MINING ACTS (JUNE 30TH, 1919).

Nature of Holding.	Number.	Area.
Mineral leases	344	15,532 acres
Gold leases	73	1,380 "
Miscellaneous leases	90	20,772 "
Coal and oil leases	4	1,360 "
Mineral claims	389	12,943 "
Occupation licences	209	104½ "
Search licences	48	67,840 "
Coal and oil claims	12	7,680 "
Gold claims	3	10 "
Total holdings	1,172	127,621½ acres

REGISTERED FROM JANUARY 1ST, 1919, TO JUNE 30TH, 1919.

Miscellaneous leases	19	2,845 acres
Mineral leases	11	440 "
Gold leases	7	140 "
Mineral claims	61	2,190 "
Coal and oil claims	3	1,920 "
Occupation licences	3	1½ "
Search licences	19	21,120 "
Miners' rights	479	—
Total	602	28,656½ acres

MEN EMPLOYED.

Estimated number of men employed in mining and mineral works, June 30th, 1919 :—

Copper	400
Gold	100
Salt and Gypsum	500
Other minerals	300
Smelting works, etc.	1,700
Total	3,000

GENERAL NOTES.

Reports, as under, will be found— Page.

The average price of copper in London during the six months has been—

	£	*s.*	*d.*
Standard	81	9	8
Electrolytic	87	15	4

The average market prices for standard copper per ton during the war were—

		£	*s.*	*d.*
Six months ended—	December 31st, 1914	56	16	10
	June 30th, 1915	71	1	1
	December 31st, 1915	74	4	4
	June 30th, 1916	111	14	7
	December 31st, 1916	120	8	0
	June 30th, 1917	133	12	5
	December 31st, 1917	116	12	3
	June 30th, 1918	110	5	0
	December 31st, 1918	120	18	0

The average for the year 1918 is £115 11s. 6d., and for the 10 years—1908-1918—£80 6s. 6d.

Soon after the cessation of the war the market price of standard copper dropped from an average of £115 11s. 6d. per ton for 1918 to an average of £83 7s. for the first three months in 1919. This meant that the Wallaroo and Moonta Company was obliged to practically cease productive operations, retaining only enough hands (about 400) to keep the mines unwatered, and generally to keep all the properties of the company in the spic and span neatness and apple-pie order which have been such distinguishing features of the company's holdings for many years. This is the most serious break in the continuity of operations since the companies, *i.e.*, the Moonta and the Wallaroo, amalgamated in 1889. There was a break in 1910 for 10 weeks in consequence of a coal strike in New South Wales, and a few years further back a stoppage for a week occurred for the same reason.

The copper market now is in better condition, and it is anticipated that as soon as coal supplies can be obtained operations will be resumed.

A certain amount of copper mining has been done in the following mines :— Barilla, Blinman, Breaden Hill, Big Lode, Belliak, Diamond Jubilee, Depot Springs, Dome Rock, Great Gladstone, Last Chance, Lovely Gully, Mount Burr, Mutooroo, Nuccaleena, Nichol's Nob, Paull's, Poona, Wild Dog, Yudnamutana, and others.

After the stoppage of the Wallaroo and Moonta ore raised could not be marketed, and in some cases work was discontinued altogether, while in others the holders have occupied themselves in further surface prospecting.

From the *Mount Gunson Copper Mine* 323 tons of 8 per cent. ore were forwarded to Cockle Creek for treatment.

At the *Emily Gold Mine*, hundred of Barossa, work in the way of shaft sinking, cross cutting, and driving has been in progress ; 100 tons of stone have been raised and a parcel of 10 tons forwarded for treatment at the Mount Torrens Government plant.

On the *Dustholes Gold Mine*, near Mount Grainger, Mr. Nicholson's treatment plant has been completed. The results have not been satisfactory so far, but with certain modifications in the way of concentration and treatment better results are hoped for.

Deloraine Gold Mines.—During the six months 2,656 tons of ore have been treated for 1,521ozs. gold bullion, valued at £5,847 18s. 7d. (or 44s. per ton), and 2 tons 2cwt. copper valued at £159 9s. 9d., making the total gross value of the mine's production for the six months £6,007 8s. 4d. A report on this property by the Inspector of Mines will be found at page 50, and the manager has supplied the following summary of operations for the six months :—

The south drive at the 192ft. level has advanced a further 62ft., making a total of 612ft. from main shaft. As this drive is now under the old original workings, a rise has been started to connect with No. 7 shaft.

The winze on footwall lode at the 292ft. level has been sunk to a depth of 33ft. and a pump chamber excavated. The reef in bottom of winze shows a width of 20in. and value of 41s. per ton.

The bulk of the ore treated during the past six months has been broken from the stopes at the intermediate level.

Iron Knob Ore, on the Wharf, Newcastle, N.S.W.

Iron Ore, at the Broken Hill Proprietary Co.'s Wharf, Newcastle, N.S.W.
To face p. 12.]

The *Mount Malvern Silver-Lead Mine* is, with the except on of some prospecting, closed down at present.

The *Olivaster Silver-Lead Mine*, near Rapid Bay, has only been worked at intervals. The bottom crosscut has been extended and cleared of debris. The adit level has been extended 15ft. and various prospecting work carried out.

Work is in progress at the *Talisker Mine*, near Cape Jervis ; 80 tons of arsenical ore have been raised, and the holders have erected a 50 H.P. high pressure steam engine, powerful overhead pumping gear, double 10in. flanged pipes with 9in. plunger pumps, including foundations, belts, and other sundries.

Asbestos has been found in the Franklin Harbor district. Detail reports are given at pages 38–40.

Deposits of high class *barytes* have been worked in the Hills District, but the marketing of the output has been much hindered by the transportation difficulties.

A report by the Assistant Government Geologist on the discovery of *whiting* near Port Lincoln will be found at page 40.

From the *felspar, china stone and clay* deposit on Kangaroo Island 20 tons have been sent away for testing.

A considerable amount of prospecting work done in connection with the *alunite* discoveries on the eastern shore of Yorke Peninsula has revealed the presence of large bodies of alunite, but, so far, difficulties in the way of treatment have prevented these deposits being made of economic value.

A small amount of alunite has also been raised from the workings near Yankalilla.

Mineral leases have been taken out by the Broken Hill Proprietary Company on an occurrence of ironstone near old Middleback Station, situated between the Iron Knob and Franklin Harbor. Prospecting by contour cuttings is in progress on these leases.

Developmental work and operations at the *Australian Manganese Company's* holdings, Pernatty, have been much curtailed owing to the dry season in that locality.

Owing to the heavy rains in February the salt season was much interrupted, but still returns show that a very satisfactory amount of salt has been scraped. Efforts are being made to exploit the salt deposits in the west, on Eyre Peninsula, and also in the north-west at Lake Dutton, near Woocalla.

The gypsum returns are satisfactory, but the shipping troubles have, of course, interfered considerably with business.

A rain in February provided water for a time at Stuart's Range, and about 100 men were soon on the opal field. Returning miners state that a fair amount of good opal is being found. Attempts to provide a supply of water by boring have not yet been successful, but further work is still in hand.

The only men who can remain on the field are those who have been able to store a supply of drinking water in galvanized iron tanks. All the waterholes in the district are dry, and it is doubtful whether drinking water can be obtained within 35 miles of the field.

Leigh Creek Coal.—In connection with the possible exploitation and utilization of the field by individuals, syndicates, or companies, the attitude of the Government has been clearly expressed by the public announcement recently made by the Hon. the Minister of Mines, which is briefly as follows :—

1. Any proposal for the working of the coal will receive sympathetic consideration.
2. Any individual syndicate or company showing to the satisfaction of the Government that it is in possession of sufficient working capital for developmental purposes will be enabled to work the coal.
3. No tentative promises to absorb production will be given, but the Government will take the coal for any purpose for which it may prove suitable, provided that the price does not exceed the value of the coal.

There is no prejudice whatever against the use of Leigh Creek coal. It is to the interest of the State if the coal can be utilized, but only if its use is advisable on economic grounds.

Leigh Creek Coal as Powdered Fuel.—By courtesy of the Adelaide Cement Company a parcel of 5 tons of Leigh Creek coal was dried and powdered and used in the firing of a large rotary cement kiln.

The coal, which was dried to about 15 per cent. of moisture, pulverised without difficulty, and the run showed that it could be burned in the kiln and maintain the temperature necessary for cement making. The amount, however, was too small to enable any idea to be formed as to the quantity used compared to the Newcastle slack ordinarily employed.

A larger quantity was then tested, but, owing to the fact that the dryer in use is designed for the removal of less than 3 per cent. of moisture from Newcastle coal, it could not remove the very much larger proportion from double the tonnage of Leigh Creek coal per hour. Consequently, although again no difficulty was experienced in pulverising the coal, the powdered coal, though apparently dry, contained 19 per cent. of moisture. This moisture caused the feed to the air blast into the kiln to choke, and delays and irregularities in running ensued. It was estimated that from 2 tons to 2·25 tons of Leigh Creek coal were required to do the work of 1 ton of Newcastle.

It is probable that with more complete drying and more regular running this ratio would be reduced to nearly the ratio between the calorific values of the coals.

The ignition and combustion of the coal was very satisfactory.

DEPARTMENT OF MINES.

"THE NATIVE INDUSTRIES ENCOURAGEMENT ACT, 1872."

NOTICE OF THE OFFER OF A BONUS FOR THE DISCOVERY OF OIL.

Adelaide, December 19th, 1918.

A bonus of £5,000 is offered to the person or body corporate which first obtains from a bore or well situated in the State of South Australia 100,000galls. of crude petroleum, containing not less than 90 per cent. of products obtainable by distillation,

No application for a bonus will be considered unless the following conditions have been strictly complied with :—

1. The applicant for the bonus must have furnished to the Minister of Mines during the progress of drilling operations—

(*a*) A monthly record of work done ;

(*b*) A full log of all bores and wells sunk, whether successful or unsuccessful ;

(*c*) Samples of materials passed through by the bores, to be taken at every 50ft. sunk, and also at every change of country encountered ;

(*d*) A declaration pursuant to "The Statutory Declarations Act, 1835," of the exact locality of each bore or well. (This should be furnished with the first monthly report on the bore or well.)

2. The oil must have been stored at the bore or well from which it has been obtained until the whole 100,000galls. has accumulated.

3. The applicant must furnish with his application—

(*a*) The certificate of a licensed surveyor nominated by the Minister of Mines as to the quantity of oil so stored ;

(*b*) The certificate of the Government Analyst of the result of his analysis of samples of the oil taken by a person nominated by the Minister of Mines ;

(*c*) A declaration pursuant to "The Statutory Declarations Act, 1835," that the whole of the oil for which the bonus is claimed was obtained from the bore or well where it is stored.

4. Within 24 hours of the first discovery of oil in the well or bore, notice of such discovery must be sent to the Minister of Mines.

5. Any person who desires at any time to inspect or test the well or bore on behalf of the Minister of Mines must be granted every facility for this purpose.

6. The applicant must have done nothing contrary to the provisions of "The Mining Act, 1893," or "The Mining Act Amendment Act, 1900," or of any lease or licence granted to the applicant under either of these Acts.

W. H. HARVEY, Minister of Mines.

DEPARTMENT OF MINES.

"THE NATIVE INDUSTRIES ENCOURAGEMENT ACT, 1872."

NOTICE OF THE OFFER OF A BONUS FOR THE PRODUCTION OF GRAPHITE.

Office of the Minister for Mines, Adelaide, March 13th, 1919.

It is hereby notified that, pursuant to the powers conferred by the Act No. 30 of 1872, and of all other powers in that behalf, a bonus will be paid by the Government, on the conditions hereinafter stated, to persons who actually recover and sell graphite in the market. The bonus and the conditions will be as follows:—

1. A bonus of one pound (£1) per ton on marketable graphite will be paid to any person or body corporate producing such graphite from a mine in South Australia.

2. Such bonus will be paid on the production, to the approval of the Minister of Mines, of account sales of graphite sold prior to the 30th day of June, 1922.

3. Every applicant for the payment of a bonus shall lodge with the said Minister a declaration, made pursuant to the Statutory Declarations Act, 1915, that the whole of the graphite for which such bonus is claimed was produced in South Australia, and stating the exact locality where the same was obtained.

W. H. HARVEY, Minister of Mines.

Power Plant, Wallaroo Mines.

Wallaroo Mines Bowling Green.

To face p. 16.

CRUSHING AND CYANIDING PLANTS.

RETURNS FROM GOVERNMENT CRUSHING AND CYANIDING PLANTS FOR THE HALF-YEAR ENDED JUNE 30TH, 1919.

Name of Mine.	Locality.	Weight of Ore.	Gold Bullion Recovered.	Total Value of Gold Bullion.	Yield per Ton, in Shillings.
		Tons cwts. qrs.	Ozs. dwts. grs.	£ s. d.	s.
TARCOOLA BATTERY AND CYANIDE WORKS.					
Grand total since starting of battery ..		8,637 5 3	11,277 19 13	39,752 14 9	92
PETERBOROUGH BATTERY AND CYANIDE WORKS.					
Homeward Bound ..	Mannahill	5 0 0	14 18 4	57 4 8	228
Schuppan	Lyndoch	8 0 0	2 5 4	8 3 2	20
Golden Junction	Oodla Wirra	4 0 0	2 2 20	8 0 3	40
Total.....		17 0 0	19 6 4	73 8 1	86
Grand total since starting of battery ..		5,321 17 0	4,850 4 7	18,036 4 2	68
MOUNT TORRENS BATTERY AND CYANIDE WORKS.					
Reddaways	Mount Torrens ..	12 15 0	6 8 11	22 13 0	25
Grand total since starting of battery ..		11,303 16 3	6,773 15 2	25,485 19 9	45
GLENLOTH BATTERY AND CYANIDE WORKS.					
Grand total since starting of battery ..		3,323 12 0	2,504 19 22	8,413 9 4	50

RETURNS FROM CRUSHING AND CYANIDING PLANTS (OTHER THAN GOVERNMENT) FOR THE HALF-YEAR ENDED JUNE 30TH, 1919.

Name.	Ore Treated.			Gold Bullion Recovered.			Value.			Yield per Ton, in Shillings.
	Tons	cwts.	qrs.	Ozs.	dwts.	grs.	£	s.	d.	s.
DELORAINE GOLD MINE.										
Deloraine	2,656	0	0	1,521	0	0	5,847	18	7	—
*Total	2,656	0	0	1,521	0	0	5,847	18	7	44

* Also 2 tons 2 cwts. copper, worth £159 9s. 9d.

TOTAL BATTERY AND CYANIDE RETURNS FROM ALL PLANTS FOR SIX MONTHS ENDED JUNE 30TH, 1919.

Name.	Ore Treated.			Gold Bullion Recovered.			Value.			Yield per Ton, in Shillings.
	Tons.	cwts.	qrs.	Ozs.	dwts	grs.	£	s.	d.	s.
Peterborough	17	0	0	19	6	4	78	8	1	86
Mt. Torrens	12	15	0	6	8	11	22	13	0	25
Deloraine	2,656	0	0	1,521	0	0	5,847	18	7	44
Total	2,685	15	0	1,546	14	15	5,948	19	8	44

SUMMARY SHOWING TOTAL ORE TREATED AT STATE BATTERIES AND CYANIDE WORKS TO JUNE 30TH, 1919, FROM MINES HEREUNDER.

Name of Mine.	Locality.	Weight of Ore.			Gold Bullion Recovered.			Total Value of Bullion.			Yield per Ton, in Shillings.
		Tons.	cwts.	qrs.	Ozs.	dwts.	grs.	£	s.	d.	s.
Associated	Tarcoola	50	13	0	43	6	5	152	18	3	60
Ajax	Waukaringa	125	10	0	89	3	7	347	19	9	55
Angepena Treasure	Mount Serle	4	7	0	17	10	3	69	7	5	318
Block 245	Wadnaminga	4	16	0	9	16	10	33	18	8	141
Block 249	Wadnaminga	4	13	0	4	15	12	17	8	10	74
Bohun	Tarcoola	93	15	0	27	16	23	99	14	0	21
Barossa Cement	Barossa	98	10	0	28	9	3	114	16	6	23
Banksia	Woodside	219	17	2	180	13	7	698	11	6	63
Blumberg	Birdwood	699	12	0	600	7	22	2,257	8	4	64
Blumberg Proprietary	Birdwood	481	2	0	213	6	4	769	17	4	32
Brind	Woodside	127	16	3	44	18	4	153	0	8	23
Bird-in-Hand	Woodside	154	11	0	48	6	2	248	5	2	32
Boomerang	Outalpa	80	15	0	69	12	16	227	19	6	56
Blunsdens	Peterborough	39	19	0	3	0	19	9	14	0	4
Brilliant	Macaw Creek	9	2	0	8	15	8	29	5	10	64
Crane's Reef	Birdwood	120	12	0	41	2	10	152	7	11	25
Curdnatta	Tarcoola	777	1	0	943	3	6	3,472	4	6	89
Cobra	Birdwood	7	3	0	1	15	4	5	6	0	14
Crown	Birdwood	264	1	3	130	7	22	466	8	0	35
Copperlinka	Olary	165	3	0	111	3	0	419	3	6	50
Day Dawn	Tarcoola	983	13	0	1,546	14	19	5,172	13	7	105
Dark Hill	Near Tarcoola	25	10	0	6	3	17	20	15	9	16
Duchess Neindorf	Tweedvale	52	4	0	54	5	4	198	0	8	75
Deloraine	Kersbrook	482	12	2	569	16	23	2,116	18	8	87
Dart's Syndicate	Mt. Torrens	64	14	0	19	0	0	74	0	0	22
Durdan	Birdwood	217	16	2	83	16	12	316	10	4	29
Diamond Jubilee	Silverton, N.S.W.	12	6	0	4	7	7	13	5	10	21
Dustholes	*Vide* Myrtle		—			—			—		—
Esmonde	Wadnaminga	30	10	0	34	1	11	126	10	1	83
Eureka	Woodside	708	0	3	448	10	2	1,446	11	8	40
Evening Star	Tarcoola	11	2	2	14	5	23	42	19	0	77
Eclipse	Tarcoola	42	4	0	35	8	16	124	10	10	59
Eudunda Hope	Mannahill	32	15	0	7	18	13	30	13	4	18
Federal	Tarcoola	44	3	0	2	6	0	7	1	4	3
Federal	Woodside	41	1	0	20	16	11	81	18	6	39
Flagstaff	Birdwood	10	2	0	3	16	9	14	2	8	28
Fabian's Glenloth	Glenloth	18	10	0	18	18	13	72	17	7	78
Fabian's No. 2	Glenloth	31	13	0	14	5	4	45	12	8	28
Fabian's No. 3	Glenloth	952	3	0	1,191	3	12	4,026	19	3	84
Great Eastern	Wadnaminga	21	16	0	31	10	21	109	15	5	100
Gallipoli	Tarcoola	140	1	0	191	17	4	656	7	2	93
Government Mine	Tarcoola	445	6	0	1,024	16	22	3,386	1	1	152
Great Talunga (Black Snake)	Birdwood	369	4	3	225	7	15	834	0	1	45
Golden Gate	Angaston	159	4	0	283	9	8	1,185	15	8	149
Gowland's Reef	Mt. Torrens	101	8	3	29	11	4	106	7	3	21
Golden Thorpe	Woodside	205	17	0	86	18	10	342	4	6	33
Golden Junction	Mt. Grainger	226	15	0	151	16	8	578	18	7	51
Glen Markie	Glenloth	369	10	0	202	6	4	712	3	4	38
Great Glenloth	Glenloth	26	10	0	5	19	11	22	16	11	17
Glenloth Pioneer	Glenloth	37	19	2	29	5	9	106	18	8	56
Golden Stream	North-east	10	17	0	6	4	14	21	17	10	40
Glenloth Well	Glenloth	26	0	0	23	11	16	83	19	10	64
Golden Record	Wadnaminga	24	15	0	33	16	17	122	4	9	98
Hennig's	Parnaroo	98	12	0	22	11	10	78	0	3	15
Hall's Reef	Forest Range	50	10	0	68	10	1	247	13	11	98
Haklo	Birdwood	291	12	0	180	3	1	709	8	11	48
Homeward Bound	Mannahill	683	17	0	1,150	3	4	4,510	14	0	132
Hidden Secret	Birdwood	74	4	0	401	5	5	1,550	18	6	418

SUMMARY SHOWING TOTAL ORE TREATED, ETC.—*continued.*

Name of Mine.	Locality.	Weight of Ore.			Gold Bullion Recovered.			Total Value of Bullion.			Yield per Ton, in Shillings.
		Tons.	cwts.	qrs.	Ozs.	dwts.	grs.	£	s.	d.	s.
Hidden Treasure	Tarcoola	52	10	0	36	14	5	117	8	1	45
ronclad	Mt. Grainger ..	12	6	0	11	18	9	44	9	5	72
Klondyke.....	Mannahill	36	11	0	82	0	10	321	3	8	175
Kitticoola	Palmer	14	15	0	18	17	8	69	5	11	94
Kirkeek's Treasure...	Nillinghoo	485	0	0	780	11	9	2,845	15	0	117
King's Bluff	Olary	127	0	0	250	0	0	750	0	0	118
Lake Labyrinth	25 miles E. of Tarcoola	64	10	0	56	10	11	207	2	3	64
Last Resource	Tarcoola	152	15	0	108	9	20	384	1	9	50
Lease 938.....	Tarcoola	9	10	0	3	13	18	12	5	4	25
Lease 1022.....	Tarcoola	12	4	0	8	13	18	23	17	9	39
Lucky Hit	Birdwood	338	16	1	303	6	3	1,148	2	11	67
Little Crumb	Birdwood	77	11	2	136	14	7	516	5	7	133
Lux.....	Olary	265	8	0	156	4	21	550	17	0	41
Lady Alice.....	Barossa	24	1	0	49	15	22	195	13	4	162
Lady Edith	Peterborough ..	10	0	0	1	6	0	4	9	4	9
Lone Hand	Glenloth	446	10	0	522	5	1	1,840	11	11	82
Lake View	Glenloth	18	7	0	25	3	10	88	6	2	96
Last Chance	North-east	11	0	0	2	18	11	11	3	3	20
Morning Star.....	Tarcoola	307	0	0	555	15	7	1,876	4	10	122
Menzies Barossa	Barossa	23	14	0	15	1	14	52	10	0	44
Mount Torrens	Mt. Torrens ...	1,252	11	0	652	10	16	2,483	18	5	39
Mount Grainger	Mt. Grainger ..	690	3	1	725	17	14	2,872	8	6	83
Myrtle (Dustholes) ..	Mt. Grainger ..	282	7	1	109	6	23	387	14	5	27
Mount Mitchell	Glenloth	28	9	0	7	6	6	23	5	5	16
Medora	Mt. Grainger ..	200	0	0	182	6	23	694	9	9	69
Miners Dream	Mt. Grainger ..	18	13	0	9	3	18	33	11	10	35
Mount Paratoo	Paratoo	50	0	0	5	0	16	15	7	0	6
Mount Lyndhurst....	Lyndhurst	1	8	0	0	7	1	1	3	11	16
New Era	Woodside	794	18	0	455	6	13	1,756	6	2	44
New Eclipse or LeHunte	Woodside	189	5	0	141	13	23	529	16	9	56
New Milo	Wadnaminga .	203	5	0	256	4	14	883	12	9	85
Nectar	Mannahill	18	14	0	28	10	23	109	2	2	116
Nil Desperandum ...	Glenloth	69	0	0	21	13	17	75	3	3	21
Nackra	Nackra	36	18	0	7	2	21	25	5	3	13
Outalpa	Outalpa.....	90	9	0	53	18	16	184	1	3	40
Perseverance (Gourlay's Claim)	Earea Dam....	34	10	0	16	7	11	62	17	7	36
Proprietary	Tarcoola	6	0	0	3	8	8	10	13	6	35
Pioneer.....	Callington	97	2	0	31	8	20	120	16	9	24
Phoenix	Gawler	11	15	0	6	6	8	21	9	6	36
Royal Charlie	Mannahill	20	7	0	5	10	5	15	19	1	15
Royal George	3 miles west Tarcoola	977	17	0	566	13	13	2,071	13	8	42
Railway	West Australia	14	2	3	15	0	23	51	16	2	73
Royal Tiger	Glenloth	53	5	0	32	5	15	115	4	10	43
Ruby	Barossa	16	2	0	23	7	23	88	13	4	110
Reddaway's.....	Mt. Torrens ...	10	2	1	40	2	9	131	3	4	17
Scotchman.....	Teetulpa	14	17	0	9	18	20	34	4	8	46
Schuppan	Lyndoch	8	0	0	2	5	4	8	3	2	20
Spanish American ...	Mannahill	21	3	2	10	12	11	39	6	3	37
Shamrock	Tarcoola	48	0	0	77	13	23	303	1	9	126
Sims Section	Mt. Torrens ...	67	18	0	12	4	12	44	3	1	13
Schubert's Reef	Mt. Torrens ...	95	18	0	54	5	2	187	15	4	39
South Knappa	Woodside	7	13	0	3	7	11	13	2	6	34
Stars and Stripes	Mt. Grainger ..	20	3	0	5	18	10	22	17	7	22
Triumph	Wadnaminga .	17	18	0	8	11	17	32	4	3	35
Tarcoola Blocks	Tarcoola	650	3	0	950	12	8	2,917	8	9	82
Tarcoola Blocks, Enterprise Lease	Tarcoola	402	11	1	484	10	20	1,661	19	5	89

SUMMARY SHOWING TOTAL ORE TREATED, ETC.—*continued*

Name of Mine.	Locality.	Weight of Ore.			Gold Bullion Recovered.			Total Value of Bullion.			Yield per Ton, in Shillings.
		Tons.	cwts.	qrs.	Ozs	dwts	grs.	£	s.	d.	s.
Tarcoola United	Tarcoola	56	10	0	100	0	15	331	4	3	117
The Gem	Tarcoola	42	12	0	90	6	19	277	16	11	130
Tarcoola West	Tarcoola	53	5	0	63	14	4	253	5	11	95
Tarcoola Perseverance	Tarcoola	1,961	4	3	3,328	2	15	12,4.9	8	0	127
Tolmer's Hill.....	Tarcoola	6	0	0	1	11	16	5	8	0	18
Union Jack	Waukaringa ..	17	2	0	2	16	13	9	18	9	11
Ulooloo	Ulooloo	28	5	0	13	5	11	52	19	0	37
Vienna (Descovitch's Reef)	Mt. Pleasant ..	29	3	0	14	0	3	47	15	7	32
Virginia	Wadnaminga .	13	1	0	18	10	14	68	6	1	104
Warrigal South	Tarcoola	73	12	3	107	2	12	341	1	6	92
Wondergraph	Tarcoola	30	5	0	57	0	4	200	4	6	132
Warrigal	Tarcoola	118	17	0	134	16	4	347	18	5	58
Wilgena Syndicate ..	Tarcoola	29	15	0	23	15	12	88	10	7	59
Wilgena Enterprise ..	Earea Dam....	348	8	0	323	7	22	1,279	8	2	73
Wilgena Associated ..	Tarcoola	45	0	0	98	10	10	364	3	11	161
Wheal Ellen	Strathalbyn ...	68	0	0	18	9	5	62	8	11	18
Welsh Prince.....	Wadnaminga ..	10	0	0	3	10	13	12	8	0	25

COPPER.

AVERAGE MONTHLY PRICE OF COPPER, JANUARY TO JUNE, 1919.

	Standard.			Electrolytic.		
	£	s.	d.	£	s.	d.
January	94	14	7	105	8	4
February	78	10	3	91	11	0
March	76	17	7	79	15	0
April	77	19	0	82	0	0
May	77	16	8	81	11	10
June	83	0	0	86	6	0
Average for the Six Months	81	9	8	87	15	4

AVERAGE PRICE OF STANDARD COPPER FOR THE LAST TEN YEARS.

	£	s.	d.		£	s.	d.
1909	58	17	2	1914	60	8	1*
1910	57	3	3	1915	72	12	9
1911	56	1	10	1916	116	1	3
1912	73	1	3	1917	125	2	4
1913	68	5	8	1918	115	11	6

Average for the 10 years, £80 6s. 6d.

* Quotations for nine months only.

GOVERNMENT DRILLING OPERATIONS.

REPORT BY THE SUPERVISOR OF BORING OPERATIONS.

During the half-year ended June 30th, 1919, the No. 1 diamond drilling plant was continuously employed at Moonta, within the area reserved from the operation of the Mining Act, in probing for the Wild Dog or Eastern lode of the Yelta Area.

The staff of No. 2 drill, using a calyx drill, were engaged in boring in the Leigh Creek coal measures.

The No. 1 drill, in charge of Mr. A. W. Matthews, Engineer for Boring, carried out the following work :—

No. 18 *Bore* (for position see Review No. 29, p. 23) was drilled from 148ft. to 308ft. in felspar porphyry. Between 292ft. 6in. and 296ft. 8in. it cut a lode of quartz and felspar porphyry formation, carrying hæmatite, but no copper.

No. 19 *Bore* was located 155yds. S.W. of No. 18 Bore, and was sunk to a total depth of 634ft. in felspar prophyry, with the following exceptions :— Quartz bodies were cut between 168ft. and 168ft. 6in. and between 508ft. and 509ft. Poor lode material, consisting of felspar porphyry with a few small quartz veins and carrying a little chalcopyrite and pyrite, was cut between 278ft. 6in. and 280ft. The material was too poor to assay.

No. 20 *Bore* was placed between Nos. 15 and 19, but further to the N.W. so as to cut a quartz body known to exist west of the Eastern Lode, prior to testing the Eastern Lode at a greater depth, and was set out on a dip of 60° to the S.E. On June 30th, 1919, it had reached a depth of 377ft., and was in progress on that date. The bore was wholly in felspar porphyry, with the following exceptions :— Quartz, at 34ft. to 34ft. 6in. ; quartz and schorl, 273ft. to 273ft. 1in. Between 313ft. and 315ft. a channel containing rock meal was cut (possibly a fault plane), and from 315ft. to 330ft. the felspar porphyry contained splashes of chalcopyrite, mostly on the cleavage planes. The core containing this was too poor to assay.

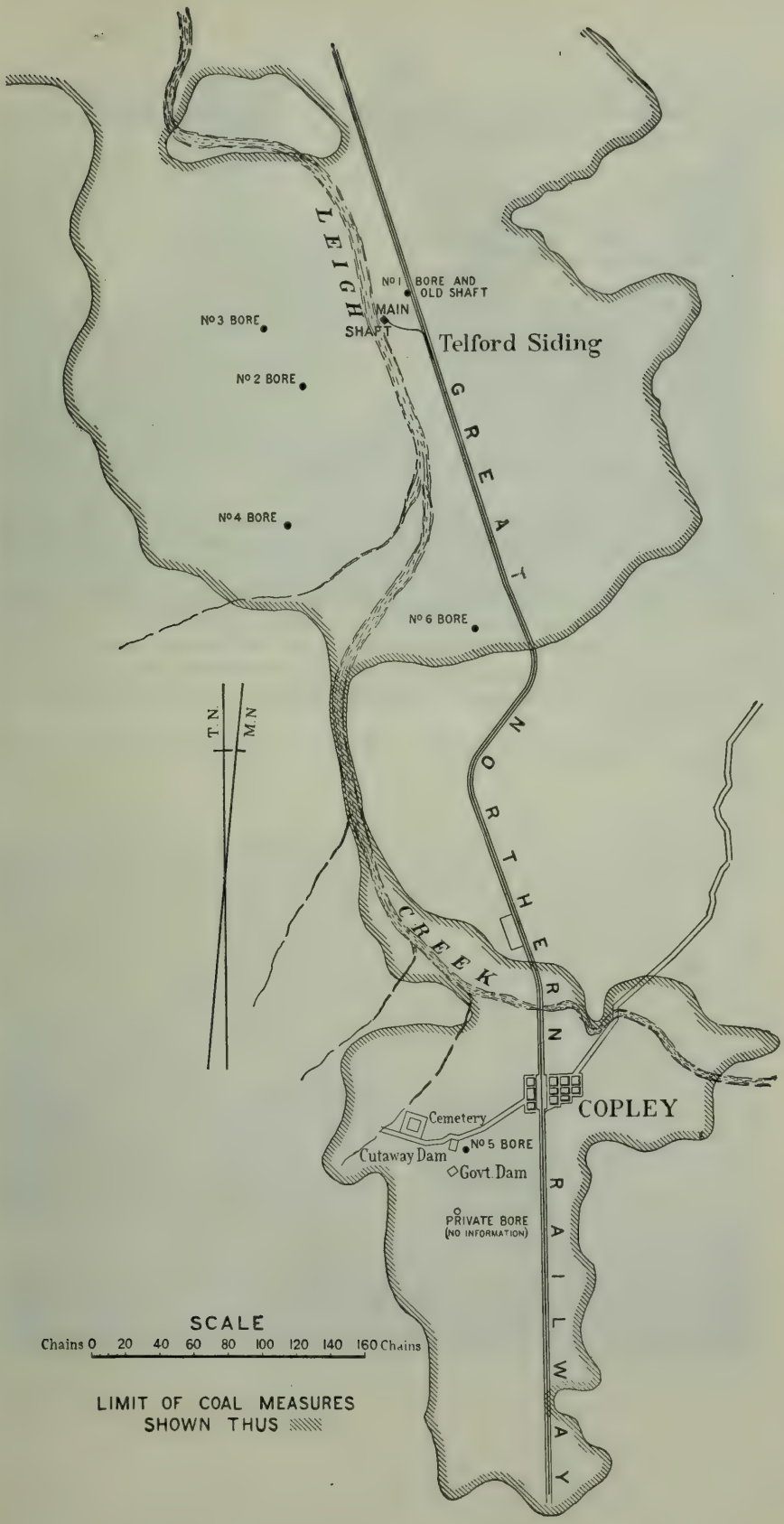
The Calyx drill, in charge of Mr. C. F. Duffield, Engineer for Boring, continued the testing of the Leigh Creek coal measures.

No. 5 hole in the southern portion of the basin was continued from 400ft. to 781ft. The core showed carbonaceous Jurassic shales to a depth of 677ft. No seam of clean coal exceeding an inch in thickness was cut in the whole depth of the bore The lower beds showed a dip of 12°.

At 677ft. fine white siliceous clay, merging into yellow soft semi-decomposed slate, with a dip of 40°, was cut. This gradually became harder, and the bore was abandoned at 781ft. after penetrating the Cambrian or Pre-Cambrian bedrock from 677ft.

The drill was then removed to the southern end of the northern basin, and erected at a spot about half-way between the colliery and the township of Copley and 29 chains S.W. of the 377 mile post on the railway line.

A hole, still in progress at the end of June, was bored to a depth of 480ft. The bore is in Jurassic coal measures throughout, the strata being more or less carbonaceous and showing plant remains. No coal had been cut at the end of June, but interbedded with the shales are no less than 15 seams of clayband ironstone, ranging in size from 4in. to 12in. and averaging 6in. A sample, taken from the seam between


LEIGH
No 1 BORE AND OLD SHAFT
MAIN SHAFT
Telford Siding
No 3 BORE
No 2 BORE
No 4 BORE
No 6 BORE
GREAT NORTHERN RAILWAY
T.N.
M.N
CREEK
COPLEY
Cemetery
No 5 BORE
Cutaway Dam
Govt. Dam
PRIVATE BORE (NO INFORMATION)
SCALE
Chains 0 20 40 60 80 100 120 140 160 Chains
LIMIT OF COAL MEASURES SHOWN THUS

199ft. and 200ft. in depth, on analysis by Mr. W. S. Chapman, proved to consist of carbonate of iron of the following composition :—

		Per cent.
Silica		13·60
Alumina		5·92
Ferric oxide Ferrous oxide	Equivalent to metallic iron, 36·67 %	47·70
Lime		·90
Magnesia		·36
Carbon dioxide		30·00
Water, organic matter, &c.		Not det.
		98·72

The analysis and mode of occurrence is very similar to that of the clay ironstones of Great Britain.

It is from these bands that the pronounced linear outcrops of limonite in the southern portion of the northern basin are derived by decomposition of the carbonate of iron.

The plan printed herewith shows the positions of all boreholes hitherto drilled in the two basins constituting the coalfield. It will be noted that the borehole in progress is the sixth drilled by the Government, and that there is another borehole in the southerly basin concerning which no details are available, the boring having been conducted many years ago by a private company which has furnished no records to the State

Particulars with regard to bores Nos. 1-3 are contained in Mining Review No. 27, page 37.

Power Plant, Wallaroo Mines.

Power Plant from Main Gate, Wallaroo Mines.

To face p. 24.

SUBSIDIES.

The Legislature provided in the Mining Act, 1893, and in previous measures for the encouragement of mining.

The following schedule shows what subsidies have been paid from the inception of the system to June 30th, 1919, and the sums repaid. In the ordinary way these repayments are made from profits—50 per cent. of such profits being devoted to repayments. In two instances only have the profits won enabled full repayments to be accomplished—the Crystal Mine, at Echunga, which repaid £76 7s.6d. from that source, and the once-famous New Alma and Victoria Mine, Waukaringa, which repaid in full the first subsidy, £3,000. The repayment of £2,100 by the Hamley Company was made on the sale of the property to the Wallaroo and Moonta Co. The remainder of the recoveries was derived from sales of mining plant held as security. The total of the subsidies advanced is £64,898 1s. 1d., of which £10,782 5s. 4d. have been recovered, and £2,250 written off, leaving a debit balance of £51,865 15s. 9d. Portion of this outstanding debt is represented by machinery that has fallen into the hands of the Government; add to this the value of the metals won, and the State in general will probably have benefited beyond the money value of the debit balance.

STATEMENT OF SUBSIDIES PAID FROM COMMENCEMENT TO JUNE 30TH, 1919.

Name of Company or Person to whom Subsidy Granted.	Locality.	Amount Advanced.			Amount Repaid.		
		£	s.	d.	£	s.	d.
Adelaide Crushing, Grinding, and Amalgamating Mill Co.	—	100	0	0	—		
Algebuckina Gold Mining Syndicate	Algebuckina	52	10	11	52	10	11
Alma Extended Gold Mining Co.	Waukaringa	3,000	0	0	249	16	0
Backhouse, T. S.	Worturpa	100	0	0	—		
Barossa Enterprise Gold Mining Coy.	Barossa, Hundred of	232	2	6	—		
Belalie Copper Mining Syndicate	Bundaleer	392	12	3	—		
Beltana Rapid Ore Treatment Syndicate	Near Beltana	596	8	4	—		
Bevilaqua & Angel	Palmer (near)	57	18	0	—		
Bird-in-Hand Gold Mining Co., Ltd.	Woodside	3,000	0	0	—		
Blackfellow's Creek Gold Mining Co., Ltd.	Kuitpo, Hundred of	660	6	7	35	0	0
Callington Copper Mining Co.	Callington	148	8	7	17	0	0
Cockburn Copper Mining Co., N.L.	Mutooroo	273	18	5	173	13	8
Commonwealth Silver-lead Co., Ltd. (Wheal Ellen Mine)	Strathalbyn, Hund. of	750	0	0	440	3	3
Copper Hill Mining Co., N.L.	Kadina	391	15	0	115	0	0
Cornwall Copper Mining Syndicate, N.L.	Kadina, Hundred of	500	0	0	—		
Countess of Jersey Gold Mining Co., N.L.	Wadnaminga	321	0	0	—		
Cowell Consolidated Silver and Copper Mines	Hds. Miltalie & Hawker	406	9	8	25	0	0
Currency Creek Copper Mining Co.	Currency Creek	28	6	5	20	0	3
Crystal Gold Mining Co.	Echunga	563	17	6	176	7	6
Davis, A. (Dorris Fabian Mine)	Leigh's Creek, Near	357	0	0	—		
Ding Dong Copper Mining Syndicate	Kanmantoo, Hund. of	124	0	4	—		
Duke of Cornwall Gold Mining Syndicate	Mount Pleasant	458	17	4	43	10	0
Eagle Silver Mining Co, Ltd.	Glen Osmond	500	0	0	—		
Ediacara Consols Silver Mining Co., N.L.	Ediacara	651	12	1	465	17	0
Enterprise Copper Mining Co., N.L.	Barossa, Hundred of	150	0	0	9	16	0
Enterprise Excelsior (Barossa Amalgamated)	"	2,000	0	0	—		
Eureka Gold Mining Co., Ltd.	Woodside	1,500	0	0	—		
Eureka Gold Mining Syndicate	"	340	17	11	—		
Fels, J. A. R. (Nichol's Nob Mine)	Leigh's Creek, Near	150	0	0	—		
Fifth Creek Central Silver and Copper Mining Co., N.L.	Fifth Creek	253	2	4	—		
Fortress Hill Mining Syndicate	Fortress Hill	60	0	0	—		
Foster, A. E. J. (David Copperfield Mine)	Hundred Onkaparinga	19	5	0	—		
Glenloth Mining, Battery, & Options Co., N.L.	Glenloth	515	4	7	515	4	7
Glenloth Wells Pioneer Blocks Co., Ltd.	"	100	0	0	22	18	5
Great Eastern Gold Syndicate, N.L.	Wadnaminga	300	0	0	—		

STATEMENT OF SUBSIDIES PAID—*continued.*

Name of Company or Person to whom Subsidy Granted.	Locality.	Amount Advanced. £	s.	d.	Amount Repaid. £	s.	d.
Gumeracha Gold Mining Syndicate	Gumeracha	75	0	0	—		
Golden Junction Gold Mining Co, N.L.	Hundred of Coglin	231	10	0	—		
Golden Point Claims	Wonna	50	0	0	—		
Great Ironclad Gold Mining Co.	Teetulpa	218	6	9	—		
Hakendorf, C. H., and Williams, J. (Glenmarkie Mine)	Glenloth	221	17	6	12	0	0
Hamley Copper Mining Co.	Wallaroo	2,100	0	0	2,100	0	0
Homeward Bound and Klondyke Gold Mines, N.L.	Mannahill	192	17	1	48	18	6
Heithersay, J. (Kirkeeks Treasure Mine)	Waukaringa	819	8	0	3	19	9
Hunter Bros. (Lady Millicent and Nuccaleena Mines)	Mochatoona	699	19	10	12	0	0
Ireby Gold Mining Syndicate	Mount Grainger	35	4	3	—		
Kanappa Copper Mining Co.	Hundred Angas	146	19	11	1	5	0
Kanmantoo Copper Mines Syndicate, N.L.	Kanmantoo	150	2	1	—		
Kingsborough, W. A. (Benowrie Mine)	Near Cutana	31	18	6	—		
Kirkeek's Treasure Gold Mining Co.	Waukaringa	691	8	1	—		
King's Bluff G.M. Co., N.L.	Olary	622	0	8	—		
Kohinoor Gold Mining Co., N.L.	Kangaroo Island	100	0	0	—		
Kohinoor Mine (H. G. Taylor)	"	200	0	0	—		
Lady Alice Gold Mining Co.	Barossa, Hundred of	1,797	2	3	—		
Lady Franklin Syndicate	Port Lincoln	200	0	0	40	0	0
Leigh's Creek South Coal Mining Co., N.L.	Leigh's Creek	95	16	4	95	16	4
McMurtie's Claims	Kuitpo, Hundred of	199	19	11	—		
Mingary Gold Mining Co.	New Luxemburg	400	0	0	—		
Montacute Gold and Copper Mining Co., N.L.	Sixth Creek	400	0	0	—		
Mount Victoria Mine	Bimbowrie	50	0	0	—		
Mount Malvern Silver Mining Co.	Blackwood	491	3	6	—		
Mount Malvern Silver-lead Mining Co., N.L.	Clarendon	1,539	6	4	—		
Mount Pangæus Gold Mining Co.	Hahndorf (near)	56	1	4	—		
Mount Monster Gold Mining Syndicate	Kuitpo, Hundred of	350	0	0	1	0	0
Mt. Grainger Ironclad Gold Mining Syn., Ltd.	Mount Grainger	21	18	10	—		
Mount Torrens Gold Mining Co.	Mount Torrens	1,000	0	0	—		
Mount Remarkable Mining Co., Ltd.	Wongyarra, Hund. of	122	8	1	15	0	0
Musgrave Ranges Prospecting Association	Musgrave Ranges	47	2	0	—		
Mount Painter Corundum and Gem Syndicate	Mount Painter	47	3	1	—		
Morning Star Gold Mining Co.	Teetulpa	68	4	6	—		
Mutooroo Copper and Silver Mining Co., Ltd.	Mutooroo	500	0	0	500	0	0
Myrtle Gold Mines, N.L. (Dustholes)	Hd. Coglin	370	1	4	25	0	0
Nackara Proprietary Copper Mining Co., N.L.	Nackara	100	0	0	—		
Nackara Proprietary Gold Mining Syndicate.	Nackara	100	0	0	—		
New Banksia Gold Mining Syndicate	Nairne	250	0	0	—		
New Alma and Victoria Gold Mining Co., Ld.	Waukaringa	3,000	0	0	3,000	0	0
New Ajax Consolidated Gold Mining Co., N.L.	"	750	0	0	—		
New Era Gold Mining Co., Ltd.	Woodside	1,000	0	0	—		
New Glenloth Battery and Mining Co., N.L.	Glenloth	750	0	0	—		
New Medora and Grainger Gold Mines Syn., N.L.	Mount Grainger	1,421	9	9	—		
New Mingary Gold Mining Co.	New Luxemburg	250	0	0	—		
New Mount Grainger Gold Mines, N.L.	Mount Grainger	393	7	1	220	0	0
Northern Mining and Smelting Co., N.L.	Mount Rose	350	0	0	3	15	0
North Nairne Gold Mining Co.	Nairne	500	0	0	—		
North-West and West Australian Pros. Co.	North-west of S.A.	104	9	7	—		
North-West Prospecting Association, N.L.	Tarcoola	150	0	0	—		
Nil Desperandum Teetulpa Devt. Co., N.L.	Teetulpa	64	14	4	20	5	6
Nilpena Copper Mining Co., Ltd.	Blinman	290	5	3	—		
Olivaster Silver-Lead Mining Co., N.L.	Hundred Yankalilla	300	0	0	—		
Onkaparinga Dredging and Mining Co.. and Echunga Propy. Hydraulic Gold Sluicing Co.	Biggs' Flat	1,050	0	0	700	0	0
Paull's Consolidated Copper Propy., N.L.	Burr Well	525	0	0	16	13	0
Parara Mining Co., N.L.	Maitland	571	3	6	—		
Paringa Mining Syndicate	Callington	399	16	8	244	0	0

STATEMENT OF SUBSIDIES PAID—*continued.*

Name of Company or Person to whom Subsidy Granted.	Locality.	Amount Advanced.			Amount Repaid.		
		£	s.	d.	£	s.	d.
Paringa and West Kanmantoo Consolidated Copper Mine, N.L.	Callington	1,144	3	4	210	5	0
Pioneer Gold and Copper Mining Syndicate	"	95	15	6	66	19	6
Polmear, W. J. L. (Poona Mine)	Kadina	800	0	0	31	0	0
Poonana Silver, Lead, & Copper Mining Syn.	Hundred Mann	137	7	10	—		
Port Lincoln Copper Co., Ltd.	Reedy Creek	800	0	0	—		
Prince Albert Mining Syndicate	Hundred Onkaparinga.	214	0	0	2	0	0
Queen Bee Mining Co., N.L.	New Luxemberg	250	0	0	250	0	0
Quorn Manganese and Silver Mining Co.	Quorn	10	9	10	—		
Rapid Bay Silver Mining Co., N.L.	Yankalilla, Hund. of..	136	2	4	—		
Robertstown Bright Silver Lead Mines	Hd. Bright	170	5	11	—		
Royal Charlie Gold Mining Co.	Mannahill	153	18	5	—		
Rees, R. (Ajax Mine)	Waukaringa	604	14	5	—		
Saunders, L. E. (Great Eastern Mine)	Wadnaminga	98	10	0	—		
Sixth Creek Gold & Copper Mining Co., L.N.	Sixth Creek	161	1	11	—		
Stainbank, A. T.	Fifth Creek	70	14	11	—		
Sliding Rock Copper Proprietary, N.L.	Sliding Rock	2,000	0	0	32	11	0
Tarcoola Blocks Gold Mining Co., Ltd.	Tarcoola	4,345	5	2	214	10	5
Tarcoola Enterprise Gold Mining Co., N.L.	"	100	0	0	19	10	4
Tarcoola Proprietary Gold Mines, N.L.	Tarcoola	150	4	4	9	15	0
Teatree Gully Gold Mining and Pros. Assn.	Teatree Gully	234	5	7	—		
Teetulpa Mining and Crushing Co.	Teetulpa	349	11	4	—		
Teetulpa Prospecting Syndicate	"	49	15	6	—		
Trewartha S.H. (Royal George Mine)	Tarcoola	10	0	0	—		
Tumby Bay Copper Mining Co., N.L.	Hutchison, Hund. of..	800	0	0	—		
Utica Copper Mining Co. N.L.	Burra	224	16	7	109	18	6
Victoria Hill Amalgamated Gold Mining Syn.	Barossa, Hundred of ..	38	12	6	—		
Victoria Tower Mining Co., N.L.	Mannahill	345	18	9	90	0	0
Walton Hill Copper Mining Syndicate	Near Freeling	50	0	0	—		
Warrakimbo Propy. Copper Mining Synd.	Barndioota, Hundred of	220	16	2	—		
Warra Warra Propy. Copper Mines, N.L.	Farina	322	4	11	322	4	11
Watt's Gully Gold Mining Co.	Gumeracha	50	0	0	—		
Watt's Gully Reef Claims	Gumeracha	50	0	0	—		
Wolters, F. C., & Co	Echunga	25	0	0	—		
Wallaroo Central Mining Co., N.L.	Kadina	500	0	0	—		
Westward Ho Mine (Dr. H. Dixon)	Mannahill	1,000	0	0	—		
Wohler, H., & Co.	Myponga	20	0	0	—		
Wheal Turner Copper Mining Co., Ltd.	Prospecting on proposed line to Queensl'd Border	1,000	0	0	—		
Winninninnie Gold & Silver Propy. Co., N.L.	Winninninnie	86	3	6	—		
Woodside Boring and Mining Syndicate	Woodside	422	17	11	—		
Worturpa Exploration and Mining Co., Ltd.	Worturpa	800	0	0	—		
Yelta New Copper Mining Co., N.L.	Wallaroo	1,000	0	0	—		
Young Bullfinch Gold Mining Co., N.L.	Talunga, Hundred of	146	3	4	2	0	0
Totals	—	64,898	1	1	10,782	5	4

Notes on the Sampling and Valuation of Prospects

The Department of Mines, Flinders Street, Adelaide, frequently receives for assay and advice, parcels of various minerals and ores. Such a parcel may have one or more of the following faults:—

(1) It may contain a single piece, obviously picked.

(2) The quantity forwarded may be of insufficient size either for assay purposes or to properly represent the material sampled.

(3) The parcel may be unaccompanied by any statement or request showing the information desired.

(4) It may carry no marks to identify it with the letter of advice.

(5) There may be no letter of advice.

(6) There may be no declaration of the exact locality, without which free assays cannot be made.

(7) The letter of advice may contain no information as to the width or size of the body from which the material has been taken—information which may be necessary before it is possible to advise as to the value of a deposit.

THE MEANING OF THE WORD "SAMPLE."

A specimen is not a sample. A specimen shows the nature of a rock or ore; a sample is intended to show its value, and must be representative of a pile of ore or of a lode at a definite place.

A "representative" sample is a small proportion of the original bulk, containing, in unchanged percentages, all the constituents of the original lot. Such a sample gives the value of a pile of ore. The average of a number of samples, broken from the workings of a mine, represents very closely the value of the material sampled. Both broken ore and mines are, in many cases, sold on the values arrived at by sampling.

HOW TO TAKE A SAMPLE.

In sampling a lode, samples should be taken at definite intervals, and the lode should be sampled over measured widths at these localities. Widths should be measured at right angles to the lode, that is, along the shortest line between the walls.

A sample must be taken by breaking the same bulk for each foot of width. This should be done as evenly as possible over the whole width that the sample is intended to represent, and all the material that would be subsequently milled or smelted, whether rich or poor, should be included in the sample. The quantity taken might amount to one pound per foot of lode width; but the nature of the ore body and the distribution of the values (whether uniform or irregular) must be considered when deciding on the size of the sample. With uniform values the interval along the lode can be greater and the amount broken less than if the lode carries irregular values, as in the case of a lode carrying coarse gold.

THE PROPER WAY TO REDUCE THE SIZE OF A SAMPLE.

Such a sample, if of any considerable size, should then be broken into smaller pieces, well mixed, and quartered down. Quartering down means that the broken ore, after mixing, is piled into a cone on a floor or cloth, and that the cone is flattened and subdivided into four parts by two cuts at right angles. If the ore is sufficiently broken and mixed the sample obtained by taking the two opposite quarters, A A, has a value equal to the rejections B B, shown in the following diagram:—

HOW A SAMPLE SHOULD BE QUARTERED.

At each quartering care should be taken to sweep all rejections away.

By successive finer crushing and quartering, a sample, of 1lb. to 2lbs. is obtained that has the same value as the bulk first broken from the lode. This sample of 1lb. to 2lbs. should then be properly bagged, marked, and sent for assay. It would be well to enclose a specimen of 1oz. to 2ozs. of the uncrushed ore for inspection.

In reducing the large sample first obtained it is essential that the lumps of ore be broken smaller by at least half between each quartering. For example, a sample averaging, as broken, 1in. pieces, might be broken to ½in., ¼in., and ⅛in. particles before each successive quartering, to ensure uniform mixing and the even distribution of the valuable material.

THE USE OF ASSAY RESULTS.

Individual samples of standing ore may differ from the true value of the lode, but the average of a number of such samples will be very nearly that of the body of stone which they represent. Thus it will be seen that, in estimating the value of standing ore, reliance is to be placed, not on a single sample, but on the average value of a number of samples.

THE VALUATION OF BROKEN ORE.

Sampling a pile of broken ore may be done either by quartering, or by taking every second, tenth, or any other proportion of shovelfuls when shovelling the pile over, the proportion depending upon the way in which the values are distributed through the ore.

In sinking or driving on a lode, the value of the ore broken can be determined by making a separate pile with every fifth or tenth bucket of ore raised, and cutting down the small pile so made by shovelling and quartering. This procedure, if adopted, would in many cases prevent undue disappointment or the incurring of a loss through sending unpayable material to be treated.

ESTIMATION OF GOLD CONTENTS BY PANNING.

In estimating gold contents by panning during prospecting work, representative samples of constant weight or bulk should be taken. Too often a selected lump of kindly appearance is crushed, with the result that the value of the ore is over-estimated, and disappointment results when a parcel is sent to a battery. A record kept of all panning results, and the position and width of lode over which a sample is taken, will do much towards facilitating the opening up of a mineral property.

SUGGESTIONS FOR TAKING AND FORWARDING SAMPLES.

It is suggested that the following precautions be taken in sending samples for assay:—

(1) Each sample should be taken so as to be representative of the material sampled.

(2) Each sample should be properly marked so that it can be identified by the Department and by the sender.

(3) A letter of advice referring to these marks should be sent containing particulars as to—

(*a*) The exact location of the material sampled relatively to some well-known point.

(*b*) The width over which the sample has been taken.

(*c*) The depth at which it was taken.

(*d*) What valuable constituent is supposed to be present.

The Department reserves the right to refuse to make any particular assay of samples of insufficient promise or which do not conform to the conditions enumerated above.

No assays will be made of metallurgical products, and no umpire samples or materials showing free gold will be tested.

ASSAYS AT SCHOOL OF MINES.

NUMBER OF ASSAYS MADE FOR PUBLIC PURPOSES AT THE SCHOOL OF MINES ASSAY DEPARTMENT DURING THE SIX MONTHS ENDED JUNE 30TH, 1919.

	1919.					
	January.	February.	March.	April.	May.	June.
Department of Mines	39	48	48	36	100	24
Public assays.....	33	58	55	46	43	34
Totals.....	72	106	103	82	143	58

ACCIDENTS IN MINES AND QUARRIES.

A gratifying feature of our mining operations in mines and quarries is the infrequency of serious accidents. Act No. 858 of 1904, bringing quarries in the same category as mines as regards the control of the Department of Mines has been effective in safeguarding the interests of quarry-men. The following table gives the number of accidents in mines and quarries during the last ten years:—

ACCIDENTS IN MINES AND QUARRIES.

Accidents in Mines.				Accidents in Quarries.			
Year.	Total Number of Accidents Reported.	Number of Persons Injured.	Number of Persons Killed.	Year.	Total Number of Accidents Reported.	Number of Persons Injured.	Number of Persons Killed.
1909	6	5	1	1909	1	1	—
1910	5	3	3	1910	2	1	—
1911	2	—	2	1911	—	—	1
1912	3	2	1	1912	2	—	—
1913	10	8	2	1913	—	—	2
1914	3	2	1	1914	3	2	—
1915	3	—	3	1915	3	2	1
1916	5	1	4	1916	—	—	1
1917	8	6	2	1917	2	2	—
1918	7	5	2	1918	2	2	—
*1919	—	—	—	1919	1	1	—

* First six months of 1919.

REPORTS FORMING ADDENDA TO THE RECORD OF MINES.

REPORTS

BY THE

Assistant Government Geologist (R. Lockhart Jack, B.E., F.G.S.)

REPORT ON THE MOUNT CRYSTAL BARITE MINE, NEAR INGLEWOOD, MINERAL CLAIMS 11080 AND 11081, COMPRISING THE WHOLE OF SECTIONS 577, 576, AND 575, HUNDRED OF PARA WIRRA.

This mine is situated about half a mile from Paracombe, which is on the main road between Inglewood and Millbrook. The outlet for the material is by road to Port Adelaide. The main opening is 15 chains N. 70° E. from the S.W. corner of section 577. At this point a body of barytes striking E. and W. and dipping 75° S. is visible as an outcrop and in an open cut for a total length of 113ft.

To the westward the body appears to die out, and an outcrop of micaceous and specular hæmatite is visible. The eastern portion has been opened by a cut 55ft. long, and exposes barytes for a width of 8ft. to 9ft. by a length of 40ft. Waste has been filled into the western portion of the cut, but it is stated that barytes is underfoot. To the eastward, soil conceals the possible extension. The cut is scarcely deep enough to have got below the weathered outcrop in which the barytes has become white and opaque, and in part stained with iron. The kernels of the larger masses and the bottom of the cut show high quality unweathered barytes, showing a bluish translucent tinge ; 4ft. in the centre of the body being of especially good quality.

Specular iron ore occurs in the barytes as spots and along planes, and will necessitate sorting to produce a first-grade product. This mineral, being a primary one, is likely to persist in depth, but it is evident that the bulk of it occurs in zones that can be picked out and rejected. The disseminated specks are more difficult to deal with, but it appears probable that, for any purpose for which a little iron is not deleterious, a good quality second grade can be obtained. Some of the barytes shows vughs, apparently after pyrite, filled with brownish-yellow ochre, and in specimens pyrite was seen ; it is, however, scarce, as none was seen *in situ*.

There is also a small amount of brown silicified undigested country here and there in the lode, but it is readily detected and removed.

It appears that after the superficial weathering and discoloration is passed through the proportions of the various grades, which may reasonably be expected to be picked, will be in the vicinity of—

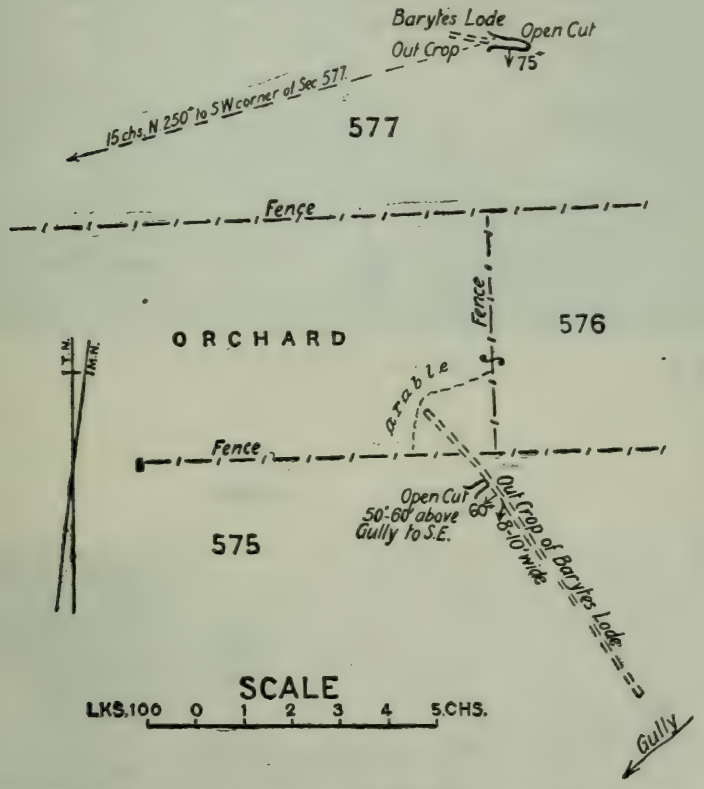
(1) Firsts, free from discoloration and all but an occasional speck of hæmatite, 50 per cent.

(2) Seconds, good color but containing disseminated specular iron, 25 per cent.

(3) Waste, barytes mixed with much iron, 25 per cent.

This estimate can only be regarded as provisional in the absence of a sufficient face of unweathered ore, and the precise proportions have yet to be found by systematic working and sorting.

Eight chains S. of this body is a cut opened from the W. and stopped just after breaking into another body of barytes, which strikes N.W. and S.E. and dips about 60° to the S.W. The outcrop shows at intervals for 500ft., of which 85ft. are in section 576 and the balance in section 575.



Sketch Plan showing workings on Mount Crystal Barite Mine.

The body has not been cut across in any place, and the outcrop is partly concealed by stretches of surface soil. There is, however, no reasonable doubt as to its continuity. In width it has the appearance of being of fair size, and immediately S.E. of the cut there appears to be a width of outcrop of at least 8ft., and possibly 10ft. The south-eastern end of the outcrop is in a gully 50ft. to 60ft. below the crest of the hill, and if desired it would be possible to work the body by adit. There would, however, be the need to construct a road of egress down the gully and through orchard land. The barytes, where exposed by the cutting, is finer grained than that of the northern deposit, and is of good color and high purity.

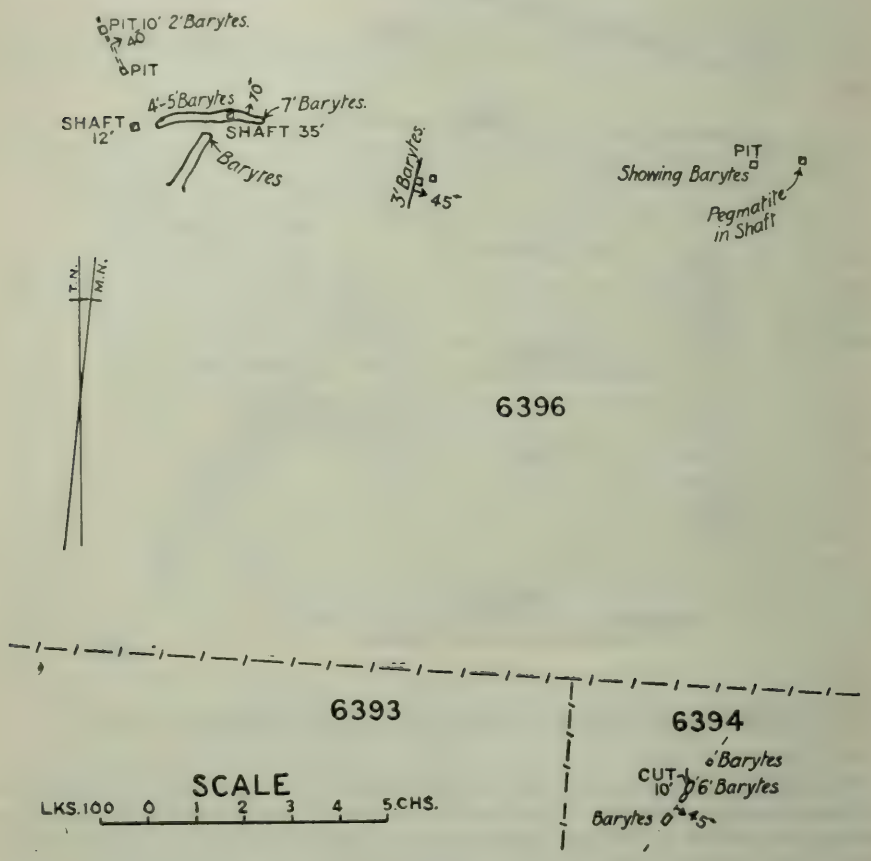
Specular iron is associated with the barytes in this body also, but, as far as may be seen in the limited exposure, is more concentrated into zones than in that to the N. It would be advisable to continue the cut through the body, as there appears to be a prospect of obtaining clean firsts with less picking than in the case of the northern lode. (15-2-19.)

REPORT ON THE MOUNT BARITE MINE, NEAR BIRDWOOD.

Section 6396, Hundred of Talunga.

This property is situated about 2½ miles from Birdwood Railway Station, to which ore may be carted over a good road.

Several distinct bodies have been worked on these sections. The main lode has been more or less continuously worked for a length of 140ft. on an E. and W. course to irregular depths, and to a maximum, in a shaft now fallen in, of 36ft. The underlie is about 70° to the N., and the lode cuts across the country, which has a dip to the eastward. It is stated that 900 tons of barytes have been removed from this working in the past.



Workings on Mount Barite Mine.

The barytes beneath the weathered cap is of good quality and free from deleterious inclusions. Widths of 4ft. to 5ft. and up to 7ft. in the eastern end were noted, but the cut is in a bad state owing to falls of the sides and indiscriminate dumping of waste. Thirty feet to the westward a shallow shaft exposes barytes, apparently the same body. An approach has been cut for 85ft. from the southward with the intention of rendering the main open cut accessible. It has just touched a body of barytes in the top N.E. corner of the face. The barytes has not been broken into, but appears to be of good quality, and is a different body to that exposed in the open cut. The cut will have to be extended 25ft. to break into the open cut,

Newland Road, Wallaroo Mines.

Inside Main Gate, Wallaroo Mines.

To face p. 34.]

and when this is done it will enable the old debris to be removed and mining of barytes to be resumed. Some is standing as pillars, but the bulk will have to be won from the ends and from underfoot.

From the western shaft, on a bearing of N. 25° W. and 75ft. and 140ft. distant, are two pits on a barytes lode 2ft. thick dipping 40° to N. 65° E. The barytes exposed in the N. pit, 10ft. deep, is of good quality.

Four chains E. of the main workings a small underlie shaft exposes 3ft. of barytes dipping N. 80° E. at 45°. The body has not been broken into to any extent, and it cannot yet be determined what the quality may be. The little that has been broken is weathered and discolored.

Six chains to the E. of the latter pit an opening through alluvium cut barytes, but has collapsed, and the barytes could not be seen *in situ* nor its attitude determined. A trace of pyrite was visible in the barytes on the surface.

Section 6394, Hundred of Talunga.

Thirteen chains to the S. of the last described opening and 2 chains inside section 6394, at a point 15½ chains W. of the eastern boundary of the section, some recent work has been done on a body 6ft. wide dipping 45° to S. 60° E. Four openings in all have been made in a length of 105ft., all on barytes. The deepest working is 10ft., and the outer portions of the stones are still weathered. The barytes, where free of weathering, is of good quality but requires cleaning from the stained and weathered material on the surface of the blocks. The footwall is of schist parallel to the lode in strike and dip, and, being soft, enables the barytes to be readily undercut and broken out.

This and the main workings on section 6396 are the most important bodies, and attention should be concentrated on them. (17.2.19.)

REPORT ON THE CLAIMS OF THE PORT LINCOLN PLUMBAGO SYNDICATE, N.L.—M.C. 10696-9, SECTION 116 S., HUNDRED OF LINCOLN.

(*Vide* Review No. 27, p. 61).

A number of costeans and small shafts have been sunk on these claims since they were first seen by the writer.

The original shaft is stated to have been deepened to 22ft., but was filled with debris to 19ft. from openings 12in. into the E. and 2ft. into the W. end. These openings showed a little disseminated flake and that the dip was 75° W. x N.

A second shaft, 58ft. to the N.N.W. of the original, was seen to 21½ft. It is sunk in decomposed rock of gneissose structure, with bands carrying small flake, dipping 60° to S.S.E. A little disseminated small flake is present, the bands carrying a slightly greater amount and iron stainings. The total quantity of carbon present, both as amorphous and flake graphite, is very small, and not likely to increase, the material giving the impression of having been formed by the decomposition of rock containing sparsely distributed graphite. Twenty-seven feet N.W. of the original shaft a 6ft. pit exposes very fine flake and amorphous graphite in hard limestone. A trace of magnesite is also present. The material is very poor, but this and the next described pit appear to have touched the most promising portion of the zone.

A pit 5ft. deep 30ft. W.S.W. of the original shaft shows 4ft. of white practically barren argillaceous material, but the western 15in. and wall showed small flake similar to that in the pit 27ft. N.W. of the original shaft. The dip is 75° W. A costean 40ft. E. of the shaft shows quartzite and traces of flake in the soil, but is obviously off the graphite zone.

A second group of workings centre about a shaft 480ft. S. 10° W. from the original shaft. This southern shaft is 16½ft. deep and shows some grey amorphous graphite and some small flake, the whole looking very poor and unpromising. Eighty feet to the N.W. and a similar distance to the S.E. costeans and small pits show the absence of graphite in the soil.

A series of five samples had been sent in by the syndicate to the Government Metallurgist on December 8th, 1918, and were tested by him. Results ranged from 2 per cent. to 0·6 per cent. of flake, the best coming from a depth of 18ft. The pits to the N.W. and W.S.W. of the original shaft yielded ·6 per cent. and 1·1 per cent. from depths of 6ft. and 3ft.

The result of the exploratory work seems to indicate that the best portion of the zone has been disclosed, but the results obtained are quite unpayable. There is a possibility of improvement beneath the pits W. of the original shaft, although it would have to be very great to bring the material within the grade of payable ore, especially as the size of the body would probably necessitate mining by underground methods.

The best way to test this would be to crosscut W. from the bottom of the original shaft, when the body exposed on the surface would be cut at 30ft. to 35ft. from the shaft. Should this crosscut prove a substantial improvement to have taken place, the body might then be followed down by a winze, if necessary rising to the surface along the ore body to facilitate the work of sinking. (24.3.19.)

REPORT ON THE WHEAL BARTON, SECTIONS 442 AND 404, HUNDRED OF JELLICOE.

(*Vide* Review No. 25, page 64.)

The S. shoot, described in Review No. 25 as extending over a length of 100ft. and showing the presence of copper in a caved shaft and two caved stopes, has been the scene of more recent operations by the present company. The proposed new main shaft has been started and sunk to a depth of 9ft., about 10ft. S. of the southern caved stope or open cut, which is believed to be shallow. The new shaft, 7½ft. by 3½ft., underlies 70° to the westward and exposes lode formation in the ends and bottom and on the footwall side. The formation is decomposed somewhat crushed sandy slate, carrying four veins of brownish friable iron-stained quartz from 1in. to 6in. thick. Stones of good copper carbonate and oxide ore occur in or near these veins, and are increasing in amount in the bottom, where up to 6in. of fairly solid ore may be seen. A few hundredweights have been taken out, of a grade of 15 to 20 per cent.

The lode is next exposed 280ft. to the southward where an old shaft, fallen in, and possibly originally 50ft. in depth, shows the lode to be copper-bearing. About 50ft. N. of the new shaft the southern end of an old stope has been cleaned out to a depth of 7ft. The lode shows 4ft. of formation stained with carbonates and carrying stones of good grade ore. The shaft is well placed for the testing of the untried ground to the S. of it and to enable a drive to be carried N. beneath the adjacent stopes which extend, with an intervening block of unworked ground, for 100ft.

At the same time it must be recognised that it is not in a position to work the main Wheal Barton shoot. The shaft must accordingly be considered as being a prospecting shaft only and should not be sunk as large as 10ft. by 4ft. inside timber. A shaft 6ft. by 4ft. should be ample, and would be sunk faster, cheaper, and farther for the money available than the large one proposed.

The cost, excluding purchase of timber, in this class of country should approximate—0 to 50ft., £1 10s. per foot ; 50ft. to 100ft., £2 10s. per foot ; below 100ft., £3 per foot, unless wet ; driving, say £2 to £2 10s. per foot. It should be sunk on the underlie for the sake of the information and ore acquired, and if driving shows that the lode requires a larger shaft in that position, it can then be stripped and timbered as a working shaft.

Wheal Barton Main Shoot.—N. of an old caved stope N.E. of the old vertical shaft a new stope has been taken out over a length of 30ft. and an average depth of 18ft., and a maximum of 23ft. from surface. The width of formation is about 3ft., and 19 tons of ore assaying 19 per cent. copper have been shipped from here, viz.—11 tons of 23 per cent., 5 tons of 17 per cent., 3 tons of 7 per cent. (screenings). Ore is showing in the bottom and ends.

Half a chain to the N. a shaft has been sunk to 16ft., and exposes limonite stained formation with good carbonate of copper commencing to show in the bottom. The future of the mine is still, in the opinion of the writer, dependent on developments below the partly worked out main shoot. A well-placed vertical shaft exists that has apparently tapped the lode, either direct or more probably by a crosscut, in the sulphide zone. It is in moderate repair, the two upper sets would require renewal for safety, and one or two sets appear to have given way at between 30ft. and 40ft. in depth. Old timber from the surface has also been dropped into the shaft. Water level is believed to be about 80ft., and below this the shaft, except for debris, should be in good condition. It would be far less expensive to put the shaft in order for an inspection than to reach an equal depth elsewhere, and if the results were satisfactory, even if the whole shaft had to be retimbered, it would be cheaper to utilize the old shaft and the presumably existing crosscut from which to develop the lode in depth than to sink a new main shaft. Such an inspection and possible working on the bottom level would require the installation of a steam pump. For reasons already given in Review No. 25, page 65, the writer considers that a pump capable of delivering 4,000galls. an hour would clear the mine of water without undue delay.

To summarise—

(1) The proposed main shaft is in a good position as a prospecting shaft, but it should be sunk as such until drives prove a sufficiency of ore to justify cutting the shaft down and converting it to a working shaft.

(2) The main shoot should be examined from the old vertical shaft, which is well placed to serve as a working shaft. It is on the extension of this shoot downwards that the future of the mine would seem to chiefly depend, and the extraction of ore from blocks of unworked ground at the surface is making no provision for the future, and can only be regarded as a temporary expedient. (29-3-19.)

GRAPHITE.

SECTION 66, HUNDRED OF KOPPIO.

(*Vide* Review No. 26.)

The original shaft, seen in May, 1917, to a depth of 21½ft., was stated to have been deepened slightly and a crosscut put out 30in. to the eastward. The back of the crosscut was 16ft. below the surface, and the shaft had filled with debris to a depth of 17ft.

There is fair grade ore exposed for 2ft. 6in. in the crosscut and 18in. in the shaft, and a sample cut across this width of 4ft. yielded 6·0 per cent. of flake assaying 94·3 per cent. carbon ; 3ft. of ferruginous and lower grade material to the W. yielded 4·0 per cent. of flake assaying 92·3 per cent. of carbon.

These samples are higher up the shaft than those taken in May, 1917, but the crosscut is new, and exposes ore not hitherto seen. The body has undoubtedly increased in size and in recoverable flake from the surface down.

The outcrop of the band the shaft is sunk on can be traced continuously to a costean a chain to the N. Here the band, about a foot in width, is highly ferruginous and contains a considerable proportion of flake. Between these two openings and to the eastward of the quartzitic wall bounding the graphitic formation a vertical shaft has been sunk to a depth of 50ft., in the expectation of cutting the graphite body, which has an apparent dip to the E. The shaft passed through vertical decomposed argillaceous rocks containing no graphite. A borehole in the western end cut no graphite, which is evidently still to the westward. The shaft is untimbered and inaccessible, and would require to be timbered before it could be used again. Its bottom is about 12ft. below that of the original shaft.

To the S. of the first shaft one had been sunk to 16ft. (water level), but is off the graphite and has been allowed to fall in.

An examination of the surface shows that to the W. and N.W. of the original shaft there is a second graphite-bearing formation some chains in width, bounded on the W. by quartzite.

There is a promising ferruginous outcrop possibly 6ft. in width about 2 chains N.W. of the original shaft. This outcrop shows a good deal of flake, and a sample gave a very ferruginous concentrate, which, after severe regrinding, yielded 2·0 per cent. of flake, calculated on the original ore, and assayed 75·7 per cent. of carbon, the contamination being due to iron. As this is so much wider than the outcrop exposed in the costean and original shaft, and as the latter shows the graphite body to increase in width and purity with depth, it would certainly be advisable to trench across the 6ft. body to a depth of, say, 3ft., submit a sample over the width of ore exposed, and determine whether work should be concentrated on this or the original shaft.

The latter justifies timbering the top, sinking to, say, 40ft. from the present depth of 21½ft., and crosscutting the body seen in the bottom, and which at that depth will probably be wholly to the eastward. At the same time there is the possibility that the body 2 chains to the N.W. having an equally rich and much larger surface showing would give better results, and at the least it should be trenched across. (19-7-19.)

REPORT ON A DISCOVERY OF ASBESTOS IN SECTION 1B, HUNDRED OF MINBRIE.

A discovery of asbestos has been made on section 1B, Minbrie, 6½ miles to 7 miles from Cowell, in some low hills bordering the coastal plain. The enclosing rock is a white to bluish white crystalline magnesian marble, dipping at a high angle, and showing for a width of several chains. It forms two low hills and has a strike of N.N.E. at the southern end and N.E. at the northern end.

A certain amount of alteration has taken place, but it is not intense or uniform. Regional metamorphism has been more intense some miles to the N.E., and it is possible that some of the marble beds occurring in that locality may have been more highly serpentinised, and so be likely to yield a greater proportion of asbestos. The alteration minerals on 1B, Minbrie, comprise serpentine, asbestos, talc, actinolite, and a trace of amorphous and crystalline graphite. A certain amount of resinous common opal is closely associated, and, in some instances, is intermingled with the asbestos.

Narrow zones of crushing within and parallel to the main body of the marble have been developed, and the asbestos occurs in the resultant fissurings as veinlets from $\frac{1}{16}$ of an inch to a maximum of about 2in. The bulk of the asbestos is present as seams of less than a quarter of an inch. The zones do not exceed 2ft. or 3ft.

in width, and are separated from the adjoining zones by several feet, or even yards, of comparatively unaltered marble.

The south-western slope of the southern hill shows less alteration and less development of asbestos than the north-eastern slope, where the bulk of the work has been done. The work done here comprises a number of shallow trenches and holes exposing the different vein systems. With no continuous cutting across these systems no definite estimate of the relative proportions of hand-picked fibre, milling rock, and waste could be formed, but a careful inspection of the work done and of the intervening outcrops gave the impression that it is very doubtful if as much as a half per cent. of the rock to be broken would be crude hand-picked asbestos, and the amount of milling rock, or rock that could be treated mechanically for the separation of the fibre, is not likely to exceed 15 per cent. to 20 per cent.

The fibre obtained from here ranged up to 1½in. long, and the limit of hand-picking would probably be material exceeding ⅜in. in length.

This area is separated by a narrow alluvial-filled gully from the north-eastern hill, on which two pits 6ft. and 8ft. deep have been sunk on asbestos-bearing zones about 18in. in width. The asbestos ranges from an inch and a half downwards. The marble as a whole is better exposed and appears to contain a lesser proportion of asbestos-bearing zones than the area first described. The asbestos is the variety known as chrysotile, and a sample, with which a little limestone was associated, had the following composition when analysed by Mr. W. S. Chapman :—

	Per cent.
Silica	36·58
Alumina	1·68
Ferric oxide	1·20
Ferrous oxide	nil
Magnesia	35 03
Lime	6·84
Soda	·44
Potash	·20
Water at 100° C.	·30
Water over 100° C.	10·90
Carbon dioxide	5·94
Chlorine	present
Manganous oxide	present
	99·11

It is white in color and is of good tensile strength, though not sufficiently so to be regarded as of spinning quality.

Comparison with material of known value used in Australian manufactures indicates that it should have a value of £30 to £40 per ton for hand-picked fibre. The shorter material that could be recovered by milling would have a much lower value, probably not more than £10 per ton, and possibly considerably less. The cost of handling the deposit by open cut would be approximately as follows :—

Quarrying	3s.	per ton broken
Picking 50 per cent. of broken rock as coarse waste	1s.	"
Picking 30 per cent. of broken rock as fine waste	1s.	"
Contingencies and general expenses	1s.	"
Total	6s.	"

The result per 100 tons broken would be approximately 20 tons of milling rock, which would not be an asset unless the deposit proved to be of sufficient size to justify the erection of a mill, and a proportion of hand-picked fibre.

As the cost of handling 100 tons of broken rock would approximate £30 it follows that about 1 per cent. of hand-picked fibre would have to be recovered to pay expenses. It is improbable that such a recovery could be made.

A suggestion has been made that it would be advisable to costean across the deposit to get a better idea of its possibilities. If this is done where the bulk of

the work has been carried on it would be advisable to reject the upper 18in. from the costean and then to take a further depth of 2ft. to 4ft. for the length of the costean, picking out and weighing recoverable fibre and carefully separating and determining the proportion between barren rock and milling rock. A sample of the material saved as milling rock could then be tested for the content of recoverable fibre. With the data so collected a definite estimate of the possibilities of the deposit could be made. (15-4-19.)

ASBESTOS ON SECTION 13, HUNDRED OF MILTALIE.

About half a mile to the westward of the asbestos find on section 1B, Minbrie, an outcrop of magnesian marble striking N.N.W. occurs, and has a width of several chains. It is distinct from the bed on 1B, Minbrie.

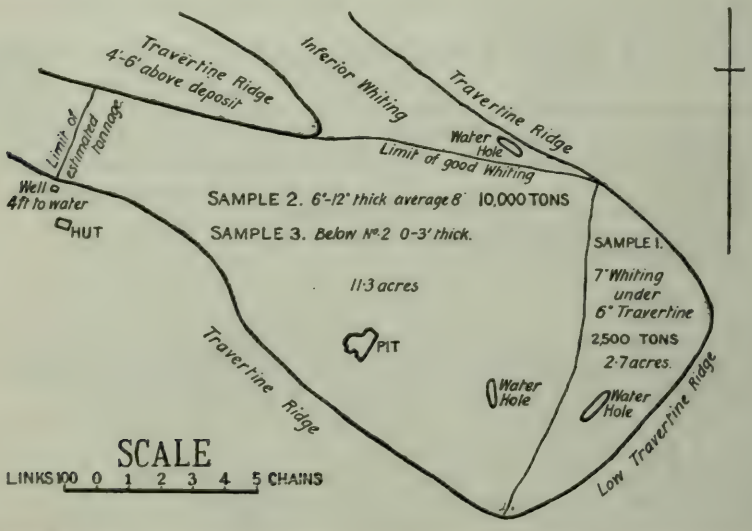
Asbestos was found while ploughing, and a trench 10ft. long and up to 2ft. deep has been made along a vein of asbestos. The maximum length of fibre noted was 2in., but both vertically and longitudinally, partings were observed which reduced the length of fibre. Many of the loose surface stones carry asbestos, and it would be advisable to costean across the outcrop of the bed, first stripping the surface 2ft., and then separating the material from the bottom of the costean into hand-picked fibre, milling rock and waste, and determining the proportion of each present.

The quality of the fibre is good, and is indistinguishable from that found on section 1B, Minbrie. (15-4-19.)

REPORT ON THE WHITING DEPOSIT AT THE THREE WATERHOLES, NEAR WANNA HUT, HUNDRED OF FLINDERS.—MINERAL CLAIM 10861.

A claim of 40 acres has been taken up by Mr. H. C. Wollaston, of Port Lincoln covering a small dry lake or swamp in which the whiting occurs.

An opening has been made upon the lake from which about 60 tons to 70 tons have been raised, and in addition the deposit has been exposed in many places by stripping off a few inches of overburden, so that the horizontal extent can be readily determined.



Plan showing the distribution of Whiting on Mineral Claim 10861.

Three grades of material may be recognised, occurring as follows :—

No. 1. White when dry and when wet with water. It occurs in the E.S.E. portion of the deposit, and is capped by about 5in. to 6in. of white tabular travertine limestone, and rests on greyish and mottled travertine. A little sand is seen in places beneath the whiting, but can be kept quite distinct. The area underlain by this deposit is probably 2·7 acres, and the exposure in the banks of the eastern waterhole shows 7in. of whiting. Allowing an average of 6in. and 24 cubic feet to the ton for the material in place, there should be approximately 2,500 tons in this portion of the deposit.

No. 2. White when dry, and cream-colored when wet with water. It is found over an area of 11·3 acres, possibly a little more, and the bed is the continuation of the No. 1 grade bed. The overburden is dark and calcareous soil from 3in. to 12in. in depth, and averaging a little over 6in. The whiting bed where seen varied from 6in. to 12in. in depth. and is separated by a parting plane from the underlying No. 3 grade, Assuming a mean depth of 6in., which is probably conservative, but allows for waste in digging and taking 24 cub. ft. in place to the ton, this bed should contain over 10,000 tons.

No. 3 Grade. Cream, with a tinge of grey when dry, and dark-grey when wet with water. The floor of the depression appears to be a slightly irregular sheet of grey and mottled travertine, and the No. 3 grade whiting occurs between it and the overlying No. 2 grade. It has been exposed in the working, and depths of from 3ft. to nothing are recorded. The tonnage is probably very considerable, but could not be estimated. From the nature of the deposit there is probably quite as much as there is of No. 2 grade.

Mode of Origin.—The deposit is near the sea, being separated from it by a range of sand dunes, and the whiting has obviously been formed in a fresh or brackish lagoon. There are two modes that may account for its deposition—

(*a*) By conversion of bicarbonate of lime into carbonate of lime, and the precipitation of the latter from solution.

(*b*) By secretion of lime from solution by algæ of the Chara family. The small amount of organic matter present and made visible when the material is dissolved in acid suggests the possibility of this process having taken place.

On the surface of the overburden large numbers of shells of *Coxiella badgerensis* are present, and have lived during the periodical floodings of the lagoon. Embedded in the whiting several opercula of Warrina, and a bivalve have been found. They are marine types, and suggest that at intervals the lagoon was in communication with the sea.

The Quality of the Whiting.

Physical Condition.—All three samples under the microscope are seen to be in the main extremely fine and flocculent. A little grit and occasional stones or flakes of limestone that have hardened are to be found, and in the case of No. 3 sample, weathered faces show minute shell fragments. Much of the material present is so fine that it will not settle from water for several hours.

Color.—All grades show the presence of organic matter as a grey flocculation when the material is dissolved in acid, but the amount is very small in the case of

Nos. 1 and 2. No. 3 grade, however, when wet is dark-grey, indicating that the percentage is greater. The colors when wet and dry are—

	Wet.	Dry.
No. 1	White	White
No. 2	Cream	Very light cream to white
No. 3	Dark grey	Cream with a tinge of grey

The following analyses show the composition of the crude ore and of the washed product from the No. 2 sample :—

	No. 1 Grade Crude.	No. 2 Grade Crude.	No. 2 Grade Washed.	No. 3 Grade Crude.
Silica	·38	·58	·46	1·30
Alumina	·22	·28	·43	·77
Ferric oxide	·10	·12	·07	·27
Magnesia	·86	5·15	4·81	1·52
Lime	52·90	46·94	47·99	49·45
Soda	—	·13	·02	·13
Water at 100° C.	·32	·35	·24	·40
Water above 100° C.	·98	·91	1·08	·98
Carbon dioxide	42·44	42·42	42·90	40·40
Sulphur trioxide	·24	·38	·33	·50
Chlorine	·03	·20	·06	·20
Organic and other undetermined matter	1·53	2·54	1·61	4·08
Magnesium carbonate	1·80	10·8	10·10	3·2
Calcium carbonate	94·50	83·7	85·75	88·3
	100·00	100·00	100·00	100·00

Uses.—While only No. 1 can be regarded as pure white in color, there should be a considerable opening for the first two grades for colored pigments and for the purposes generally for which whiting is used. The third grade material, though inferior in color, is like the others in such a fine state of mechanical division that there should be an opening for it where fineness and not color is the essential. In any case, in removing the overburden from No. 2 grade deposit it should, if possible, be so placed as to leave the No. 3 material available if required.

Costs.—The work of winning the material consists of stripping the overburden and digging out the whiting and stacking to allow it to dry. It should not exceed 10s. per ton on wagons. The material is bagged on the ground, and the cost of bags is not included in the above estimate. The transport is 7 miles by road to a landing place on Port Lincoln Proper. The road has been cut and cleared and blinded where required by the claim holder. Small ketches can lie safely on the ground in southerly winds, but for larger ketches the material has to be boated from the landing place, or else a light jetty a chain or so in length will have to be constructed. Ketches take the material either to Port Lincoln for transhipment or direct to Port Adelaide. While a proportion of the material can undoubtedly be shipped in a crude state, the quality and saleability would be improved if it were levigated on the ground.

The material is readily miscible with water, of which there is every prospect of a good supply of good quality 2ft. to 4ft. below the surface.

There is a tongue of travertine 4ft. to 6ft. above the level of the lagoon on which a puddler could be erected, and from which the suspended material, after passing through a sand-collecting pit to remove any coarse material, could gravitate to settling dams on an arm of the lagoon to the northward, where it would be allowed to settle and dry.

Wallaroo Mines, formerly a Salt Swamp.

Residue Dump, Wallaroo Mines.

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The cost of such work would be—One man on plant ; fuel and engine supplies ; depreciation of plant ; periodical cleaning of sand pit ; digging and bagging the washed and dried whiting. Material would be dumped by dray into the puddler, and probably the plant would be worked intermittently, a period of digging the raw material and putting it into the settling dams being succeeded by a period during which labor was concentrated on bagging the purified product.

The cost of treatment should not exceed 5s. per ton, but about 24 tons would have to be raised to provide 20 tons of grit-free whiting, the loss consisting of some grit and imperfectly separated fine whiting.

Suggestions as to plant are appended after treatment of samples by the Government Metallurgist. (28-4-19.)

REPORT ON THE TESTING OF SAMPLES OF WHITING FROM MINERAL CLAIM 10361, HUNDRED OF FLINDERS.

Three samples of whiting were examined. Sample No. 1 was treated by intermittent agitation and decantation, as well as by continuous levigation. The other two samples were dealt with by continuous levigation only.

Color of the Samples.—In the crude state there were distinct differences in colors No. 1 was the best of the three, and compared fairly well with that of a sample of whiting (presumably English) purchased at a paint store. No. 2 came next, and was very little inferior to No. 1, but the No. 3 was decidedly darker.

Proportion of Gritty Matter Present.—This can be indicated in a general way only. No. 3 was very free from grit of any kind. No. 1 contained a small proportion of more or less hard pieces of rock, which were not disintegrated under treatment. No. 2 appeared to be intermediate between the other two.

Levigation Tests.—A number of tests were made in a crude form of elutriation apparatus with the twofold object of preparing a product free from all grit and of improving, if possible, the color of the whiting.

From an examination of all the results obtained, it appeared probable that by simply washing the crude whiting in the elutriation apparatus it was possible to obtain about 80 per cent. of the crude material as a product entirely free from all grit, quite comparable with the imported article in this respect. The color, however, was not improved. The " whiteness " of the products from Nos. 1 and 2 was quite good, although not equal to that of the sample purchased. No. 3 would be of no use as a source of a pure white, its dark color being much too pronounced.

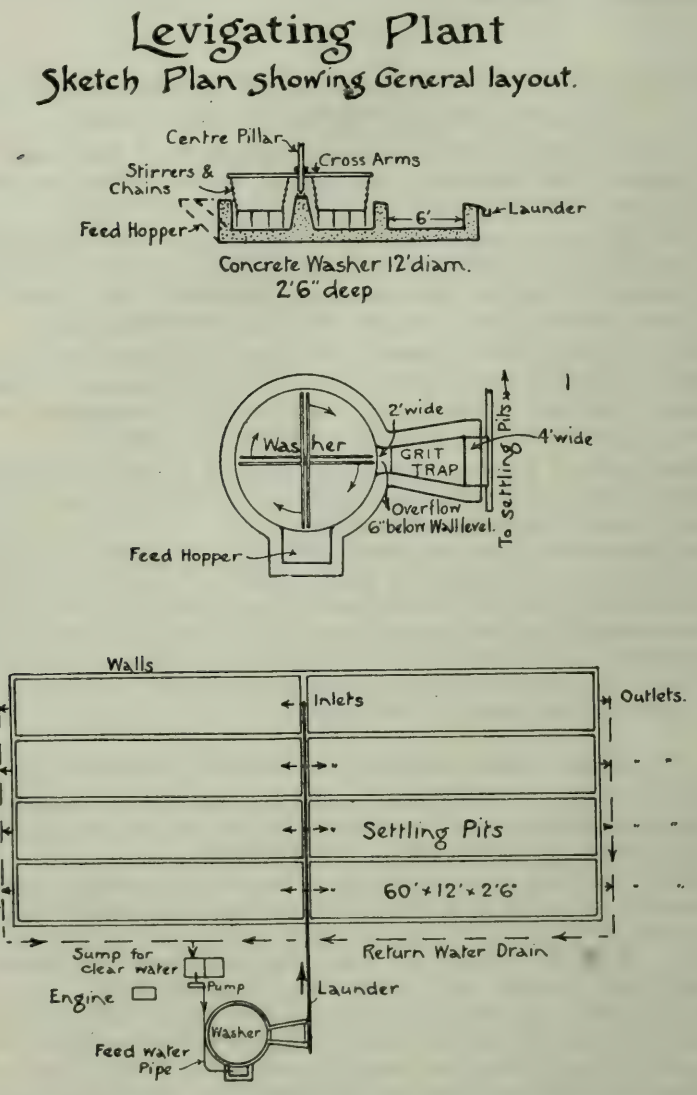
Suggested Plant for the Treatment of the Whiting.

This must obviously be of the simplest and most inexpensive character possible, and the actual details of such a plant are best left to the man on the spot. Therefore only the bare outline of a plant will be suggested here.

The whiting will have to be stirred up with water in a shallow circular tank, and the overflow from this tank passed into another and smaller tank in order to arrest any particles of grit which may be washed out of the first tank or " washer." The " pulp," or mixed whiting and water, overflows from the smaller tank or " grit trap " into a launder, and is run away to settling tanks. It is suggested that there be eight of these tanks in two rows of four each. Each tank to be about 60ft. long, 12ft. wide, and 2ft. 6in. deep. If 20 tons of crude whiting are treated per day, and if 2 tons of water are used for each ton of whiting, then each of the above tanks will hold the pulp from an eight hours' run. If the full tank be allowed to settle all night, the water in it will be sufficiently clear to be drawn off in the morning, leaving a depth of about 9in. of whiting on the floor of the tank. This whiting must then be left to dry and the filling of the other tanks proceeded with in order. Of course if it be desired to treat more or less than 20 tons a day, the size

of the settling tanks will have to be altered to suit. In this kind of plant, however, it is desirable to make each settling tank large enough to hold the product from one day's run and to make it shallow and of large area so as to facilitate the subsequent drying of the settled whiting.

Arrangements must be made which will permit of the clear water being drawn off from the settlers and returned to the washer. Some kind of a pump will be necessary, and a 1in. centrifugal would probably be the most suitable. A storage tank will also be necessary to hold the water from the settlers. The pump, of course, will draw from the tank and deliver the water to the washer. This washer should be circular in section and suitable dimensions would be 12ft. inside diameter



and 2ft. 6in. deep. In the centre of the tank there should be a pillar of masonry, or a wooden post, 2ft. 6in. high. This pillar carries the footstep bearing for a vertical revolving post carrying two arms at right angles. To these arms are to be attached by chains, or other flexible support, the stirrers which stir up the whiting with the

water. These stirrers could be made of iron harrows, rods, or anything of that kind which might be available. When at rest the stirrers should hang just clear of the bottom of the washer. There should be four stirrers in all, *i.e.*, one at each end of the cross arms. Provision must be made for supporting the vertical revolving post and for driving it from an engine. The driving gear could be adapted from an old horseworks gear. To facilitate the feeding of the whiting into the washer, it would be advantageous to build a portion of the wall of the washer on the slope, and so provide a small hopper into which the contents of a dray could be tipped A good deal of shovelling or hand feeding should thereby be avoided. The rough sketches attached to this report should make the above idea quite plain.

The " grit trap " should be built with straight sides and wider at the outside end. Dimensions are suggested on the sketches.

From time to time both the washer and the grit trap will have to be cleaned out by shovelling.

When building the washer, it is important to remember that there must be sufficient fall for the pulp to flow easily from the outflow of the grit trap to the most distant settler. The slope of the launder should not be less than 1 in 50.

The best material to use in the construction of the washer would be reinforced concrete, both for the walls and the bottom. The walls of the settlers may be made of anything available, provided they can be made watertight and not liable to contaminate or discolor the whiting. The bottom could be the natural surface, provided a permanent layer of whiting is left when shovelling.

A 4 H.P. engine would provide all the power required for operating the stirrers for the washer and also the pump. The speed of the stirrers should be 10 or 12 revolutions per minute. A drying and storage shed would be advisable.

REPORTS

BY

The Chief Inspector of Mines (L. J. Winton, B.E.).

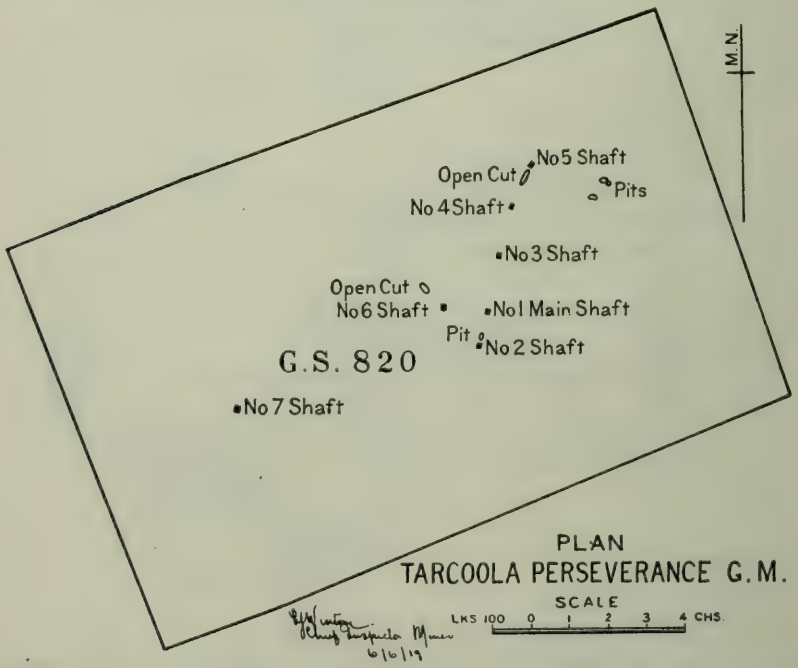
REPORT ON THE TARCOOLA PERSEVERANCE GOLD MINE.

(*Vide* Reviews Nos. 14, 15, 16, 17, 19, and 23.)

This mine comprises a single block, gold section No. 820, of 19¼ acres, at present held under gold lease No. 1468.

It is situated near the western end of a low range and adjoins the northern end of the most westerly of the leases formerly comprising the Tarcoola Blocks Mine.

The lode formation consists for the most part of white quartz and kaolin with small seams and stains of iron oxide in places, but towards the S.W. end of the main workings there is a considerable increase in the amount of iron oxide present, the lode here presenting the appearance of a decomposed ferruginous clay slate, with irregular seams of quartz. The workings, as far as could be seen, lie wholly in quartzite, through which the lode cuts, and a well-defined wall was occasionally seen on the footwall, but none was seen on the hanging wall side. The gold is in the free state, some which was seen near the surface being very fine and film-like in appearance, and probably of secondary origin.



The thickness of the lode varies somewhat, as shown by the stoping widths which vary from 8ft. down to 1ft., but the average width appears to be about 3ft.

From the stoping widths at the bottom of the mine the impression is obtained that the lode is smaller in the bottom, but this may be due to stoping operations having been restricted to narrower limits in pursuit of better values.

The lode dips steeply to the W. at angles varying between 70° and 80°, and the general strike is a little E. of N., cutting across the quartzite.

The workings are not very deep nor extensive—the main workings have a total length of five chains, the greatest depth being about 125ft., below which the shaft is said to extend a little farther.

Outside the main workings there are a couple of shallow shafts, and some pits and trenches. For convenience of description the shafts have been numbered, as will be seen on the accompanying plan.

At the S.W. end of the main line No. 2 shaft is about 40ft. in depth, from which there are no workings. One chain to the N. of this is the main shaft, or No. 1, through which the ore is raised by means of a whip.

This shaft is vertical to a depth of 104ft., at which point an underlie has been started a few feet to the W. and continued down on the lode to a total depth of about 130ft. At a depth of 122ft. this inclined portion of the shaft has been covered over and a drive has been put in on the lode for a few feet N. and filled up again. To the S. the lode has been stoped irregularly to a maximum distance of about 40ft., and possibly 50ft. in height.

To the N. the lode has been stoped out practically to the No. 3 shaft, a chain and a half distant; the depth of the workings decreasing, however, as they extend N. The No. 3 shaft is 70ft. deep, and the workings are carried down for 28ft. below this, giving a total depth here of 98ft.

No. 4 shaft is 87ft. N. of No. 3, and the workings here decrease considerably in depth, rising from the 70ft. level at No. 3 to the 40ft. level at No. 4 shaft.

N. of No. 4 shaft the lode has been stoped to a limited extent, and these workings do not appear to connect with a shallow shaft—No. 5—which is 80ft. farther N.

These workings towards the N. were inaccessible and could not be inspected or sampled.

Apart from the main lode there is No. 6 shaft, about 40ft. deep, situated a little over a chain to the westward of the main shaft, and having no workings from the shaft.

There is also another shaft 7 chains westward from the main shaft, which does not appear to be very deep, but was not accessible for inspection.

From the No. 4 shaft, at about the 40ft. level, to the 70ft. level, of the No. 3 shaft, and thence to the 110ft. level of the main shaft, the lode is worked out nearly up to the surface, with the exception of some shaft pillars and various small pillars of ore left as a support to the walls throughout the workings. At the top of the No. 4 shaft, where there is a portion of the lode left in position, some specimens of kaolin were obtained showing free gold of very fine flake-like nature, and possibly some ore might be obtained from the back of the lode which has not been stoped right out although no idea could be obtained of what quantity or value of ore exists here, the backs not being accessible; the amount in any case, however, would not be very considerable.

The general impression conveyed by the section of the workings is of a shoot of ore pitching to the S., thus resembling the behaviour of the shoots of ore in the adjacent Tarcoola Blocks Mine.

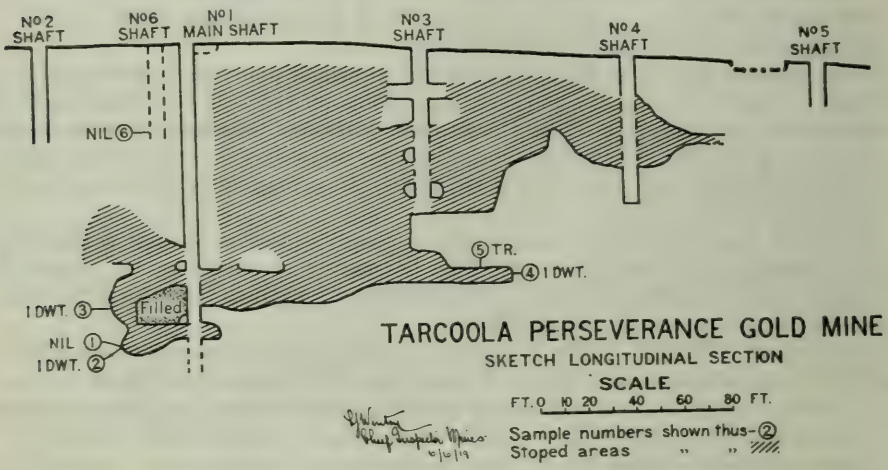
Sampling.—From the nature of the workings, which consist of a shoot of ore practically stoped out to the surface, and with no developmental work carried out, the opportunity was not offered of doing much effective sampling, the northern end, and likewise the greater portion of the southern end, being inaccessible for sampling.

Six samples were obtained, and assayed by Mr. Chapman, with the following results :—

No. 1. Sample taken from the lode showing in the S. end of the deepest workings. Width, 16in. of decomposed ferruginous kaolin on the footwall side. Assay value—gold, nil.

No. 2. Sample taken from the face at the same locality as No. 1. Width, 19in. of iron-stained quartz and kaolin on hanging wall side. Assay value—gold, 1dwt.

No. 3. Sample taken across lode in the S. end of the deepest workings, about 12ft. above Nos. 1 and 2. Width, 2ft. of iron-stained quartz and kaolin. Assay value—gold, 1dwt.



No. 4. Sample taken from the face of the drive going N. from the main shaft. Width, 3ft. of white broken quartz with kaolin. Assay value—gold, 1dwt.

No. 5. Sample taken from back of drive, 14ft. S. of No. 4 sample. Width, 2ft. of slightly iron-stained quartz and kaolin. Assay value—gold, trace.

No. 6. Sample taken from S. end at the bottom of No. 6 shaft. Quartz and kaolin, width 4ft. Assay value—gold, nil.

The facts disclosed by the sampling results and by the general appearance of the workings are that a shoot of ore has been stoped right out, that there is no ore blocked out or exposed on which to commence operations, and that the first requirement is prospecting work in order to discover ore, either by proving an extension of the ore shoot which has been mined in the present workings, or by discovering a new shoot. From the appearance of these workings and from the experience of some of the other mines adjacent, such as the Tarcoola Blocks, it would seem that the shoots of ore pitch to the S., and the best place to commence prospecting would, therefore, be at the bottom of the S. end of the mine, where a drive could be extended to the southward along the course of the lode to ascertain if there were any improvement in value in that direction.

The northern drive, from the face of which No. 4 sample was taken, could also be carried on farther N. to ascertain whether the lode showed any improvement in value in that direction. The best chance, however, appears to be to the S., and failing any discovery in a drive S. from the bottom of the present workings, it might then be advisable to sink the main shaft and do some driving S. and N. at a deeper level. There is also, of course, room for further prospecting on the surface by means of costeening trenches.

With regard to the erection of a treatment plant, such a matter is obviously out of question at present, for there is no ore in sight with which to supply a battery, without considering at all the question of the necessary water supply, which, from the nature of the ore, would require to be considerably more than the average amount. In addition to a battery, a cyanide plant would be required, as the tailing from the battery treatment varies in value from 1dwt. to 10dwts., with an average value of 5dwts. or 6dwts.

There is a certain amount of lode material stacked in dumps near the shafts, but this in itself is not sufficient to warrant the erection of a battery. Putting the total amount of dump material at 1,000 tons, and allowing for the treatment of 50 tons per week, there would only be 20 weeks' work to put the lot through, assuming that it was all worth treating.

The value of these dumps, however, is quite unknown until they have been properly sampled, and without such sampling it is not safe to assume any value for them.

This mine has to the present date produced 3,328oz. of gold bullion from the treatment of 1,961 tons of ore, the bullion being worth £12,429, equivalent to an average yield per ton of 127s.

The last four lots treated amounted to 175 tons, giving an average yield per ton of 71s. (6-6-19.)

REPORTS

BY

The Inspector of Mines (H. Jones).

THE DELORAINE GOLD MINE.

(*Vide* Reviews Nos. 10, 13-29.)

The main underlie shaft is down to 300ft., and is equipped with double winding winch, two kibble roads, and pumping appliances. The water now makes at the rate of about 10,000galls. per hour, and is pumped out by a properly equipped double-plunger well pump. The pumping service of the mine has recently been duplicated by a steam pump at the bottom of the shaft, which is kept ready for use in case of emergency, and the drainage of the workings is now being satisfactorily dealt with.

The principal workings of the mine are southward from the shaft; drives have been made in the ore channel at the 100ft., 200ft., 250ft., and 300ft. levels. The drive at the 300ft. level has reached a distance of 306ft. from the shaft, and near the end the formation is disturbed and has split into two branches with a wide horse of rock between. Each branch has been driven on for a short distance, and indications seem to point to the possibility of the two coming together again. Near the northern end of this disturbed zone a lode formation was discovered to enter the footwall at a low angle from the main channel. This was a fine body, from 3ft. to 4ft. thick, from which a considerable quantity of fairly high grade ore was stoped. In the main lode at this level, for a considerable length over the back of the drive, a large amount of stoping is in progress, and at several points the stopes extend past the intermediate drive up through to the 200ft. level. The connection of these two levels has opened up a way to dispose of the mullock obtained in the development work at No. 2 level, as now it can be sent down the various passes made and used to fill in the old open workings between the two levels and make them permanently secure, which will enable operations to be carried out in other blocks of ground which otherwise would probably have been left unworked. At the 200ft. level the S. drive is now in a total distance of 570ft. from the shaft, and is said to be within 60ft. of No. 7 workings, where the prospectors first discovered the rich channel of ore. At the back of the drive is a footwall branch of ore; a large amount of stoping has been done up to No. 1 level. These workings are open, no material being available for filling, but the exposed roof in all parts of the opening is properly secured with small pillars of ground and strong timber.

The different sections of the underground workings and the surface plant are kept in highly satisfactory order, and all appeared safe. (6-3-19.)

IRON KNOB AND HUMMOCK HILL.

The quarry workings are situated at Iron Knob, where three large openings, A, B, and C, have been made in the upper portion of the Iron Knob Hill, which has an elevation of about 700ft. above the plain. Work at present is confined to A and B quarries, both of which are extensive with an iron ore exposure of fully 100ft. high. The body of high-grade manganiferous iron ore operated upon is an immense one, and the proper method of working has been adopted, viz.:—Commencing at the top and working downward in benches to the main floor. All sections of the workings are kept in proper order, and appeared quite safe.

Suitable magazines for keeping limited quantities of explosives for current use have been erected at a proper distance from each of the quarries.

At a convenient site between the two quarries a Red Cross building has been erected, where all the necessary appliances are kept for rendering first aid in case of an accident.

A series of iron tramlines are being laid to the face of each quarry whereby several 5-ton trucks can be filled at the same time, and a double truck line down the slope of the hill to the railway bins on the flat. Appliances with double brake attachment at the top of each incline are used for lowering the ore from the quarries to the bins, the loaded trucks let down drawing up an equal number of empties to the working floor.

The power plant erected at the foot of the hill and adjacent to the ore bins consists of a large air compressor, necessary pumps, three Babcock and Wilcox boilers, fitting shop, and other buildings. Lines of pipes have been laid to convey air and water to any part of the workings. The plant and different gears in use in the works appear to be in very good order and safe.

On some high ground a short distance from the works the company has built dwellings for the workmen. The single men's department is well fitted up for two men in each room. The concrete buildings recently put up are 100ft. long, with verandah and seven sleeping rooms with shower baths and washing rooms attached. The company pays a man to look after these places and keep them clean and in proper sanitary condition.

Hummock Hill, on Spencer's Gulf, is the seaport connected with Iron Knob by a railway 33 miles in length, by which the iron ore (1,050 tons per diem at present) is carried for shipment. The company has a fairly extensive plant here, consisting of a large stationary steam engine, four Babcock and Wilcox boilers, several rock crushers, counter shafting and belting, and a long belt conveyor from the main ore bins to the end of the jetty for loading ships. The engine shop is being fitted up with various modern appliances for the work, driven by belt gearing. The machinery is housed in, and all possibly dangerous parts of the plant and belting appear to be well-secured and made safe. (21-7-19.)

THE HORSESHOE BARIUM SYNDICATE'S WORKINGS (SHEPHERD AND MURPHY'S), SECTIONS Nos. 101 AND 110, HUNDRED OF WILLUNGA.

The principal workings consist of shallow open cuts made along an outcrop of barytes striking in a north-eastern direction.

On section No. 110 there are two openings 126ft. apart, having a length of 135ft. and 50ft. respectively by an average depth of about 7ft., and at the south-western end of the long cutting a shaft has been sunk in the lode to a depth of 20ft. The material exposed in these open workings consists mainly of barytes associated with iron oxide striking N.E. and dipping S.E. at an angle of 45°. Iron oxide is much in evidence throughout the formation, occurring in thin seams and stains in all the jointings of the barytes, which is thereby much deteriorated in value. No work is at present being done on this part of the property.

On the adjoining section, No. 101, north-eastward, a large amount of work has been and is still being done along the line of lode, the main open cut being 210ft. in length, with an average depth of 8ft. A fairly wide formation is exposed carrying pockets and seams of barytes of good quality. Near the south-western

end of the open cut an underlie shaft has been sunk in the lode to a depth of 35ft., and sinking is still in progress. The barytes in the bottom shows from 3ft. to 6ft. wide, and appears to be less stained with iron than at the higher levels.

During the time the place has been worked about 500 tons of barytes of good quality have been marketed and about 40 tons are bagged at grass.

The shaft and all sections of the workings appeared to be in very good order and quite safe. (22-7-19.)

Reports on the Following Quarries:—Metropolitan Brick, Anstey's Hill, Klapper, Highercombe District Council, Melton's Clay, Elliott's Clay, Hannaford's, Adelaide (Sleep's Hill), Government Quarries (Sleep's Hill), Anderson's, Schwerkolt's, Badman's, Sims', Unley Corporation, Dunstan & Son, Adelaide Brick, Kirkham's Clay, Whiting's Clay, Dillon's Clay, Road Side, Yatala Stockade, Port Adelaide Corporation, Government Reserve, Tesseire's, Bastin's, McMartin's, Heddle's, Stanton's, Dunstan Limited. In all cases, where necessary, instructions have been given to ensure the safety of the workings.

REPORT

BY

The Chief Registrar of Mines (L. C. E. Gee, S.M.)

NOTES ON WELFARE AND BETTERMENT WORK BY THE WALLAROO AND MOONTA MINING AND SMELTING COMPANY, LIMITED, AT WALLAROO, WALLAROO MINES, AND MOONTA.

The Wallaroo Smelting Works, the Wallaroo Mines, and the Moonta Mines form the three points of a triangle.

The Smelting Works are situated on the coast, at Port Wallaroo. The Moonta Mines are about 10 miles S. and the Wallaroo Mines 5 miles S.E. from them. There is railway connection between the mines and the port.

The Wallaroo Mine was discovered in 1860, and the Moonta Mine in 1861 ; they were first worked by separate companies, which, in 1889, were amalgamated, and the properties have since been worked by the Wallaroo and Moonta Mining and Smelting Company, Limited.

It would appear that from the start of these mines the relations between employer and employee have been on a more cordial and intimate footing than is usually the case ; there has always existed an idea of permanence and home about the employment, which idea has been encouraged and strengthened by the attitude of the company regarding the welfare of the men, their safety during work, their comforts and conveniences, and the efforts to help them, their wives, and families towards enjoying, so far as possible, the amenities of life.

The following figures go towards illustrating this :—

Statement showing Length of Service of Employees over 21 Years of Age.

Period of Employment.	Number.	Per Cent. to Total.
Ten years and over	1,008	65·59
Five years, but under 10 years	236	15·35
One year, but under five years	212	13·79
Under one year	81	5·27
	1,537	100·00

Statement showing Living Conditions of Employees at the Three Centres.

Married men living in own houses on mineral leases	652
Married men living in own houses on freehold	417
Married men living in own houses on renting freehold	122
Single men living in parents' houses on mineral leases	277
Single men living in parents' houses on freehold	136
Married men boarding	44
Single men boarding	92
	1,740
Total living in own houses	1,069
Total renting houses	122

At the Wallaroo Smelting Works there are baths and change-houses throughout, and the general impression of the place is that of tidiness, space, and light.

Suburban to Wallaroo Town and at Sunnyside, a little to the eastward, freehold land belonging to the company is sold to the employees at low prices for the purpose of making homes. The company fixes the price per allotment, and the amount is paid off in instalments (say, 5s. per week) deducted from the paysheet.

At the Moonta Mines vigorous tree planting has been and is being done in all directions, and the effect is to make all the surroundings of the mines picturesque and pleasant. Miners' cottages are scattered all over the leases, some originally built by the company and others by the miners, and it may be noted that the owners of cottages on the leases pay no rents or rates. Good roads and ash footpaths have been made, and the main roads are lighted at night.

The Moonta Mines Institute was established by the company in 1868 for mine employees and others. The subscription is 1½d. per week. Useful books of reference are kept. There is a circulating library, also billiard, class, lodge and meeting rooms. The up-to-date Moonta Mines Sunday School is well known with its complete class arrangements, from infants to advanced pupils. The company has provided a large recreation hall, with stage, &c., copper, crockery, cool drink bars, and all requirements for entertainments and fairs; also a rotunda, tennis courts, swings, &c.

At the Wallaroo Mines the same vigorous policy of tree planting has been pursued with the same effect on the surroundings of the place, and, as at Moonta, the miners' cottages are all over the leases. The owners pay no rent or rates, and the company has made good, well-lighted roads and footpaths throughout. There is a good institute, and the company pays the subscription for 240 aged ex-employees and widows. The recreation ground is provided with a pavilion, croquet lawns, swings, girls' hockey grounds, &c., and in connection with it there is a fine hall, with stage, scenery, and supper rooms. The company has also established the Wallaroo Mines Bowling Green of 12 rinks, with a good club-house; the membership is limited to employees and residents on the mines. There is also a large church and a Sunday school, on the same lines as that at Moonta. This is probably the largest Sunday school in the State, there being 700 children on the roll.

Throughout the mines everywhere in the vicinity of the shafts, workings, dumps, and buildings, everything is tidy and clean; there is no "cluttering up." Change houses with hot and cold baths are provided, also meal rooms and rooms for technical classes. Every provision is made for promptly dealing with cases of accident.

Benefit Funds.—Outside of the Workmen's Compensation Act and benefit societies a medical and a club fund have been established whereby employees, in case of illness or accident, can obtain prompt medical attention and medicine for themselves and families. The club fund, after a year's subscription has been paid, ensures, in addition, a weekly payment to the sufferer. Weekly contributions are made by the employees as under—

	Medical.		Club.
	s. d.		*s. d.*
Married men	1 0	..	0 6
Single men and youths earning 5s. per day	0 6	..	0 6
Boys earning under 5s. per day.....	0 3	..	0 3

The amounts payable in case of illness, and accidents happening in the company's employ, are—

For Men.—Six months at the rate of 20s. per week, and for a further period of six months at 10s. per week.

For Boys.—Half the above rates in each case.

Owing to the heavy demands on the club fund, and the payments having thereby to be reduced, the company decided to, from September 16th, 1918, subsidise the fund in order to bring the outgoing weekly payments up to the proper amount, and at present the subsidy is 9s. 6d. in the £1.

It may be confidently stated that the sliding scale of wages instituted by eth company has also done much to preserve and solidify the generally harmonious

Central Plantation, Wallaroo Mines.

View in Plantation, Wallaroo Mines.

To face p. 54.]

relations existing between employer and employee. The following history of this movement has been supplied by the officials of the company :—

History of the Sliding Scale of Wages.

The principle of the sliding scale dates back previous to the amalgamation of the Wallaroo and Moonta Companies. Probably its first application was in the late '80's, about 1888, when copper was a fairly good price. The directors increased the wages of the employees, and in the following years as the price fluctuated so were wages increased or reduced ; however, the arrangement was purely optional on the part of the directors, there being no fixed basis.

It was not until 1903 that consideration was given to the question of preparing a sliding scale on a permanent basis, and in that year a system was adopted whereby employees would automatically share in the profits of the company. The first notice was posted on June 26th, 1903, and it provided for an increase of 10 per cent. in the wages of daywork hands and a bonus allowance of 4s. per week to men engaged in underground contracts when the spot quotations for standard copper, as appearing in the *Register* and *Advertiser*, averaged over £60 in any one month, with a further addition of 5 per cent. and 2s., respectively, should copper average over £65 per ton.

Subsequent notices were issued allowing a similar increase when copper exceeded an average of £80, also £95. The rates in force at the time of this arrangement coming into operation were slightly raised to form the " base rate." In each instance the alteration governed the payments to employees for work done in the second following month after copper averaged a certain figure, the interval being allowed to adjust the paysheets.

The first payment under this scheme was made in January, 1905, when 10 per cent. was added to daywork wages, and 4s. per week to underground contractors ; the following month another 5 per cent. was added, and so on as the price of copper advanced, until eventually 25 per cent. above the standard was reached during the period January-September, 1907 ; three months later, when copper had fallen to under £60 per ton, wages were back to normal. This basis continued until 1909, when, in consequence of the price of copper remaining for many months just below £60 per ton, it was decided to alter the arrangement slightly by making provision for 5 per cent. increase when the average price of copper exceeded £55 per ton, the other 5 per cent. to apply to £60.

Notwithstanding that during the above period and in following years the base rate had in all cases been considerably advanced, the sliding scale was again amended in April, 1914, in favor of the employees, when the rates then being paid (which, by the way, stood at 15 per cent. above the original standard) were made the base for calculating subsequent advances and provision made for increases when copper averaged £75, £85, £95, of 5 per cent., 10 per cent., and 15 per cent. for daywork labor, and 3s., 6s., and 9s. to men in underground contracts. A further amendment was made in August, 1915, by again raising the standard or base rate, and allowing for increases of 5 per cent., 10 per cent., and 15 per cent., and bonus allowance to contract men underground of 3s. 6d., 7s., and 10s. 6d. per week.

Having entered into a contract to supply the Imperial Government with copper at £120 f.o.b. Sydney, the directors in January, 1917, increased the wages of daywork hands by another 10 per cent., whilst the bonus addition to men in underground contracts was advanced from 10s. 6d. to 17s. 6d. weekly.

In 1918 the contract price obtained from the Imperial Government as £108, f.o.b. Sydney, per ton, and wages were adjusted accordingly.

Commencing 1919, there being no prospect of a renewal of the contract with the Imperial Government, the Commonwealth authorities intimated its willingness to finance the copper companies on the basis of £80 per ton for the first three months, and the wages were adjusted to the present schedule of rates, the principle of the " sliding scale " being adhered to with a minimum rate for unskilled labor of 10s. per day.